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HISTORICAL SOCIETY

BULLETIN No. 18

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TABLE OF CONTENTS

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Another year has passed. A year rich in the friendships made at our meetings in Boston of those members who have been able to attend and those who regularly visit our headquarters and who visit us from time to time. It is not without regret however that we note the passing on of two of our Life Members. Many of us will regret to learn of the passing of Mr. J. Snowden Bell, late Patent Attorney of the American Locomotive Co. Mr. Bell entered the service of the Baltimore & Ohio R. R. in 1862 as a draughtsman. This was a critical time with that road as engines were being wrecked or stolen by the enemy and there was much rebuilding at the Mt. Clare Shops. When Mr. Thatcher Perkins left the Baltimore & Ohio R. R. in 1865 to form the Pittsburgh Locomotive Works, he took Mr. Bell along as chief draughtsman. In the 70's, he returned to Philadelphia and was associated with Charles B. Collier in law and patent office work. He also pursued his studies of law at the University of Pennsylvania and graduated in 1879 with the degree of L. L. B. and was admitted to the bar in that year. His after life was in connection with patent work chiefly for the Westinghouse Air Brake Co., and the American Locomotive Co. He was an authority on front ends, Locomotive boilers, feedwater heaters and superheaters. He was one of the foremost authorities on the history and development of the locomotive, gained from his early experience. His book

on "The Early Motive Power of the Baltimore & Ohio R. R." deserves a place in the library of every student of locomotive history. In this bulletin appears one of his papers on "The New Castle Manufacturing Co." which will be of interest to our members.

Another member, one whose writings are familiar to the readers of the Bulletin, who has left us, is Charles S. Given. Mr. Given was employed by the Grand Trunk Ry. and later by the Maine Central R. R. As the result of an accident he was obliged to leave railroad service and lived at Bowdoinham, not far from Portland. Amid surroundings far from inviting and some times in actual want, yet withal his writings were cheerful and on a subject on which he was familiar—the railroads in the State of Maine.

In this bulletin we are concluding the series of articles written by Mr. Young on Locomotive Design and the letters of Mr. George A. Haggerty. The latter have recalled many incidents of early railroading and have brought about many letters from some of our older members who either remember Mr. Haggerty or the incidents themselves. Mr. Loye has contributed an interesting work on the "Birkenhead" locomotives and the list of engines that accompanies his article is well worth our attention.

In February, every member was forwarded our 1929 leaflet and our first catalogue of material on exhibition at the Baker Library. The catalogue should be of interest to every member. It shows the results of our work for over one year. It also shows what roads and localities the material is being received from and it also shows our weaknesses. We hope to correct the later during the year and will appreciate any aid that our members can give us. We also call your attention to the back numbers of the bulletin. You will note in the leaflet certain copies can no longer be furnished. We hope every member will make an effort and complete his set of bulletins while the supply is available and now is the time to procure them.

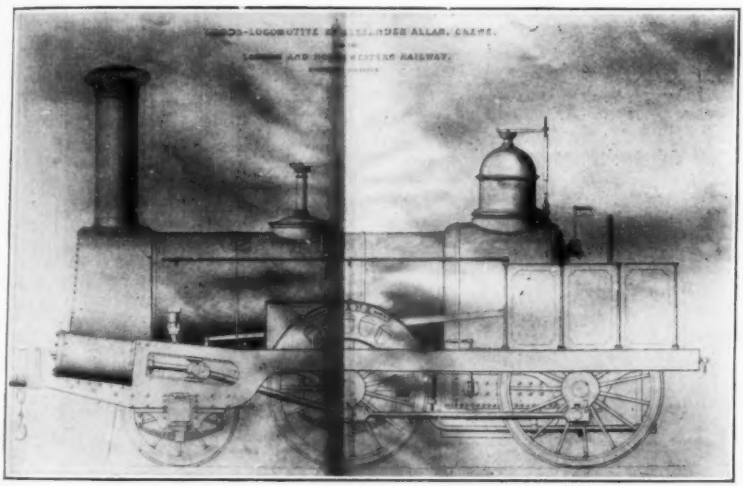
During the coming summer there will be some additions built to the Baker Library which will cause this Society to withdraw much of their material that we have on exhibition. While our members are always welcome to visit the rooms at any time, we are giving this advance notice so that there will be no disappointment. We hope in the fall to be straightened out again and hope that your visits can be deferred until that later date.

The Parent of the "Birkenheads".

By John Loye

Alexander Allan's Famous Engine, "CREWE", Built At His Works In Crewe, In 1851.

Although engines of this type appeared during the decade preceding the appearance of the Crew, yet, Allan's application of this principle of construction, as exemplified in his product of 1851, proved so successful in both the goods and passenger service of the London & North Western Railway, that it commended itself to the Directors and Engineers of the G. T. R., as the best adapted to the Canadian service.



The Parent of the "Birkenheads".

Alexander Allan's famous engine, "CREWE", built at his works in Crewe, in 1851.

It is at once apparent that the Crewe type was closely akin to the Campbell or American 8-wheeler type. The arrangement of the drive wheels was similar, except for equalizing beams, which were not employed on the Birkenheads, their wheels having individual springs well balanced. The mere removal of the leading pair of wheels, and substitution of a 4-wheel truck, produced an 8-wheeler.

DIMENSIONS OF ENGINE, "CREWE".

FROM VINNEAR'S "RAILWAY LOCOMOTIVES".

Boiler, 3'-6" diam., 9'-4 3/8" long. 158 tubes, 1 3/4" diam.
Fire-Box, width, inside, 3'-6"; width outside, 4'-1 1/8"; length, inside, 3'-0"; length, outside, 3'-7 1/2".
Area of Grate, 10.5 square feet.
Driving wheels, diam., 5' 0".
Leading wheels, diam., 3'6".
Distance between driving axles, 7' 4".
Wheel base, 12'-8".
Cylinders, diam. 15"; stroke, 20".
Length of frame, 20'-9". Over all, 22'-5".
Gauge of wheels, 4'-8 1/2".
Load on leading wheels, empty, 5 1/4 tons; loaded, 5 3/4 tons.
Load on driving wheels, empty, 7 3/4 tons; loaded 9 tons.
Load on trailing wheels, empty, 4 1/2 tons; loaded 4 3/4 tons.
Total weight of engine, empty, 17 1/2 tons; loaded 19 1/2 tons.

These weights are in long (English) tons, 2240 lbs.; or, in American tons, 2000 lbs., 19 1/2, engine empty; 21 1/4, engine loaded.

Canadian Locomotives of the Fifties.

MEMORIES OF THE "BIRKENHEADS".

By JOHN LOYE

In the last issue of the Bulletin, No. 17, I read with interest the article,—"Canadian Locomotive practice in early days", by Mr. Norman Thompson and Major J. H. Edgar. One passage came home to me. It read,—"According to a print in the Chateau de Ramezay in Montreal the 'George Stephenson' was a six-coupled machine with a straight chimney and a cab, being also equipped with a six-wheel tender. In the picture the general tint is blue green, the engine wheels being pink." Another passage read,—"Coming down to 1864 another print illustrates the 'Diadem', of the four-coupled type, with a four-wheel bogie in front, and a cab. * * A light pink tint was used for this drawing." The article dealt with the early engines of the Great Western Railway of Canada.

The prints so described were made by myself in 1903, when I was a junior draftsman with Messrs. Finley & Spence, Architects, from descriptions of the late Chas. T. Hart, of the Montreal Antiquarian Society. At his death in 1915, the pictures mentioned, together with several others of my own making, were placed in the Society's Museum, the Chateau, where they hang to-day. It is well to observe that the "Diadem" was drawn from description entirely, while the "George Stephenson" was reproduced from a cut in an issue of the Illustrated London News, appearing at some time in 1860. It was, obviously, taken

from a photograph, because it bore several workmen, or officials, on its tender, pilot and side. These were eliminated at Mr. Hart's request, and he directed me in the proper colouring of the engine, deep green and vermillion. These tints are now faded to the "blue green" and "pink" spoken of. The "Diadem" was originally coloured a deep brick red, which is now turned to "a light pink".

Apparently, another of my drawings inspired the authors in describing the "Birkenheads," the English-built engines of the Grand Trunk Railway of Canada, which came to that line from Birkenhead, England, in the years, 1854 to 1858. There are some inaccuracies in the Thompson-Edgar story of these remarkable locomotives, one being the statement that they were built "at Birkenhead for the G. T. R. about 1851." Reference to the article in question in Bulletin 17 will enable the reader to follow more clearly in the train of our narrative.

ORIGIN OF THE GRAND TRUNK

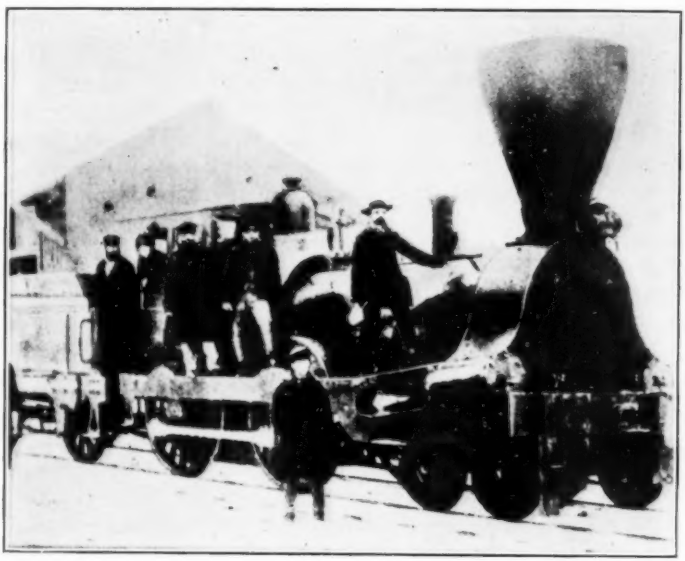
The Grand Trunk Railway of Canada came into being in the natural course of events, as in other instances in both England and America in the earlier period of railroad history, particularly in the fifties of the last century; that is, it was the product of an amalgamation, a consolidation, of several disconnected lines in operation or under construction, and which were none too strong financially. The Charter of the Company issued in 1852, and the combination of the lines involved was effected in July, 1853. These lines comprised the Quebec & Richmond, under construction, the St. Lawrence & Atlantic and Atlantic & St. Lawrence, the Canadian and American divisions respectively of the Montreal & Portland line, completed four days previous to the consolidation, and the Montreal & Kingston, Grand Junction, and Belleville & Toronto lines, which were in the charter stage.

The Grand Trunk was an enormous undertaking, even viewed from present standards. It contemplated a continuous line of rails from Trois Pistolles, on the St. Lawrence, east of Quebec, to Port Sarnia on the St. Clair, 1100 miles, and from Montreal to Portland, 300 miles. The realization of this magnificent dream came with the completion of the stupendous Victoria Bridge in December, 1859, with its twenty-five tubular spans stretching for two miles over the river St. Lawrence at Montreal. This vast project was capitalized in Great Britain. British en-

gineers and contractors devised and carried it out, and their practice and influence was for many years strongly in evidence in the workings of the Grand Trunk.

At this point it will be well to establish a few facts, and thereby dispel some false ideas which for long have stood as the truth in the minds of certain Canadian railway historians.

We have oftimes seen it stated that the 5′-6″ gauge of the Grand Trunk was derived from the London & North Western



Grand Trunk Engine (No. 50) at Riviere Du Loup, 1860.

An early type of Birkenhead, showing ⌐-frame running level with platform, and tender with rigid frame. The leading wheels have been removed and a bogie-truck substituted. This engine was delivered to the G. T. R., January, 1856, and was a freight, 5′-0″ drivers, weighing 25 tons.

Railway; that the Birkenheads were built to the same gauge as their prototypes designed for the English line by Allan of Crewe. Such was not the case. Every student of British railroad history knows that the Great Western Railway was the chief exponent of the broad gauge, 7′-0″, while its chief rival and exponent of the narrow gauge, 4′-8½″, was the London & North Western Railway.

It was these two Companies that practically waged "the battle of the gauges", where the ingenuity of Gooch and Crampton; pitted, as they were, against each other, brought forth the wonderful high-wheel locomotives of eighty years ago, that would match in speed the fastest engines of to-day.*

GAUGE HAD POLITICAL ORIGIN

In 1845 the Royal assent was given to the Charter of the St. Lawrence & Atlantic Railway, from Longueuil, opposite Montreal, to Island Pond, Vt. The purpose of this line was to connect Montreal with the sea-board, and the original intention of its Canadian and British promotors was to lay it along the south shore of the St. Lawrence to a point north of the New Brunswick Province line, and from thence south or east to St. John or Halifax, and so keep as far as possible from the American boundary in the event of war.

As Canada was at the time under a Colonial status, all such enterprises had to be passed upon by the British Government. It so happened that the American ports of Boston and Portland were offering rival inducements to Montreal for railway connections, and these were seriously considered by the British authorities, who in the end, and quite unexpectedly, too, recommended Portland as the most profitable outlet in point of distance and directness of route, and the most economical because the American interests offered to build the line from Island Pond to Portland.

The British military authorities advised that the gauge of the line be made to differ from the then prevailing standard in the New England States, 4'-8½", and the 5'-6" gauge was decided upon for that section in Canadian territory. This was to prevent its use in the event of seizure by the Americans in case of war. The good people of the State of Maine were so glad to secure the entry of this important line into their Commonwealth, that they built their section, the Atlantic & St. Lawrence, to the same gauge 5'-6" so as to facilitate business.

"Narrow Gauge faster than broad"

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*"The writer of a pamphlet under this head shows, by a series of tables, that the average rate of speed on the London & North Western, is to Wolverhampton 26.92 miles per hour, and that to Birmingham 24.28; while on the Great Western to Swindon, it is only 24.97 miles per hour, and to Bristol 23.97."

(From "The Locomotive Engine," by William Templeton, London, 1848.)

It was the building of this line, and its potential aspects, that inspired British capitalists with the idea of acquiring it, extending it, and combining it with other existing lines, and so eventually producing the Grand Trunk Railway.

Thus it came to be that Portland, Me., an American city, is the winter port of the Canadian National Railways, something which many Canadians do not understand. The G. T. R., with the approbation of the British Government, leased the Atlantic & St. Lawrence line, Portland to Island Pond, for ninety-nine years, and the term expires in July, 1952.

And thus it came that the G. T. R. was built to the 5′-6″ gauge, and it will be seen that it was in existence in the original lines for some time previous to the consummation of the Grand Trunk, and before the order for the Birkenhead engines was ever given. The first engines of the St. L. & A. and A. & St. L. were built at the Portland Locomotive Works, and delivered in 1848. They were built to the 5′-6″ gauge.

The British authorities adopted 5′-6″ as the Canadian gauge because it was a well defined medium between the prevailing gauges in the United States at the time of issuance of the Charter of the St. Lawrence & Atlantic Railway, 1845. The American gauges were the 4′-8½″ touching Eastern Canada's frontier, and also coming into Detroit, and the 6′-0″ of the Erie coming into Buffalo. In consequence, the Great Western, Ontario, Simcoe & Huron, and other smaller lines in Upper Canada, were all built to the 5′-6″ gauge.

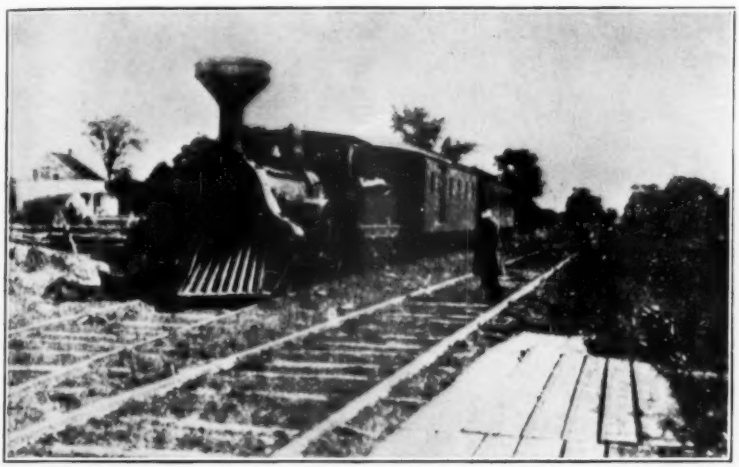
The wisdom of this policy, while it might not be questioned in 1845, eventually proved to be but a folly. With the opening of the Suspension Bridge over Niagara river came the application of the Michigan Central for a Canadian Charter to pass its line from Windsor to the bridge through Canadian territory. The charter was readily granted. It was an invasion of the standard gauge. Then, in Eastern Canada the Champlain & St. Lawrence and Montreal and New York lines were to standard gauge, or, 4′-8½″ and 4′-9″ respectively, and both led directly to Montreal from the New York State line.

In America as in England, the broad gauge was forced out of business in the end, and the broad ventures in Canada and in the United States, like the Grand Trunk and the Erie, were obliged to narrow down to common sense. The abandonment of the 5′-6″ gauge and the adoption of the standard 4′-8½″ by the Grand Trunk Ry., was a triumph for and a tribute to the good

relation of the people of the North American Continent, and their mutual desire to live untrammelled by the military provisions of Europe.

THE "BIRKENHEADS"

The contracting firm which built the Grand Trunk was that of Peto, Brassey & Betts & Jackson, who were also the builders of the European & North American Railway in New Brunswick. Their general contract called for the supplying of a quota of the motive power of the system, gradually as the work progressed.



The Locomotive, "Ottawa", on the Carillon & Grenville Railroad.

In this picture the old Birkenhead is shown with her other smokestack. As will be noticed, the track is broad guage, 5'-6".

By courtesy of Mr. W. M. Spriggs, St. Anne de Bellevue, P Q

To this end they established the Canada Works at Birkenhead, England, on the estuary of the Mersey, opposite Liverpool. Alexander Allan, the famous locomotive builder of Crewe, furnished the designs for the engines to be constructed, and his practice was evident in the products of the Canada Works. The majority of the engines turned out were 2-4-0's, and they retained all the main features of his noted engine, the "Crewe", built for the London & North Western Ry. in 1851. For years

thereafter this was the prevailing type on that railway, and the so-called Birkenheads were practical replicas.*

A notable feature of Allan's practice was the broad spread he gave to the drivers where they were double, the base being 7′-4″ in the freight engines, the wheels being 5′-0″ diameter. The first locomotives built by the Grand Trunk, 1859, adapted this principle of Allan's design, and it was evident in the subsequent productions of the Point St. Charles shops for many a day, as well as other characteristics of the parent Birkenheads.

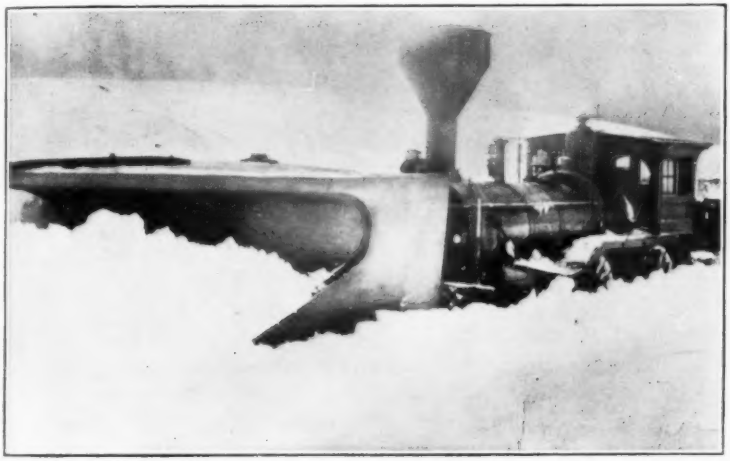
As far as the records show, fifty engines were built for and delivered to the Grand Trunk by the Canada Works. The first delivery was in November, 1854, and the final one in November, 1858, and in the course of that period of time the style of the engines altered somewhat. The first deliveries were of the 2-4-0 type, principally, but there were also several of the 2-2-2 type, single drivers, 6′-0″ diameter. These latter were very speedy, but ill-adapted to roughing it in North America in the fifties. They proved impracticable, and were rebuilt into 4-4-0's at the G. T. R. shops. No more of this type were delivered after 1855, it would appear, and only four in all were sent to Canada.

The 2-4-0 type engines were of two varieties at first, and latterly, of three varieties; that is, the freight engines had drivers of 5′-0″ diameter, and the passenger engines had drivers of 5′-6″ and, in some latter deliveries, 6′-0″ diameter. The earlier Birkenheads were heavily built and squatty in appearance. The smoke-arch was made to inclose the cylinders, which were all outside, and formed with curved, sloping shoulders measuring some 7′-6″ across, or wide enough to span the 5′-6″ gauge of the Grand Trunk rails. The engines were slab-framed, and the frames were always inside. But they carried a heavy ⌐-framing at the side, running from the cylinder to the end of the platform, with arched guards over the driver cranks. This gave them the appearance of being outside framed. This framing

*"Even as late as 1851 it was contended that, the inside-cylinder engine being then preferred, the narrow gauge could not, in respect to admissibility of this favorite type, after all compete in power with the Great Western line. No railway authority appeared willing to multiply engines of the "Liverpool" class, which was taken to represent rather what was possible than expedient. The London & North Western Company was not long, however, in bringing into use the very largest inside-cylinder engines of which the narrow gauge admitted."

From "History of the Locomotive Engine", by Zerah Colburn, London, 1871.

was made to partly enclose the piston guides, with an oblong opening exposing the piston rod. The cylinders were inclined about 15 degrees. The drive-wheels had individual springs, very well balanced, while the leading wheels were set in pedestals bolted rigid to the Γ-frame, with the spring under the journal. The tender was carried on three pairs of spoked wheels, 2'-6" diameter, set in a rigid frame. The engines, equipped for the Canadian service, had American cabs, cowcatchers, funnels and bells, but bore no headlights, and carried the sand-box under the Γ-frame, close to and in front of the forward drivers.



Birkenhead Bucking A Drift.

G. T. R. Engine No. 69, clearing the main line on the Quebec & Richmond Division, after the great blizzard of March, 1869.

NECESSARY ALTERATIONS.

In spite of the stipulation in its Charter, that the road-bed of the Grand Trunk should be equal to that of the first class English railways, the line, when built, proved to be native to Canadian soil, and no better than the average American roads of the fifties. Consequently, the Birkenheads, designed to run on the smoothly graded English lines, would not keep to the rails of the new Grand Trunk, so alteration became a necessity. The leading pair of wheels were removed, and a 4-wheel truck sub-

stituted, thus making the engine into a regular 8-wheeler, standard American type; the type which seems to have been so naturally evolved to meet the rough and ready conditions on the far flung and hastily built railroads of Western world. The 6-wheel tenders were also altered to the regular double 4-wheel truck type, and the Birkenheads thus became as satisfactory in their service as their American contemporaries, which were, principally, Portlands, Manchesters, Hinkleys and Amoskeags.

The average weight of the Birkenheads in working order was 25 tons; that of their tenders being 18 tons. In the accompanying list, taken from the Grand Trunk Annual Report of 1859, they appear after the name, "Peto & Co."

REMARKABLE LOCOMOTIVES.

The Birkenheads were not beautiful to behold. In them grace was sacrificed for strength. In the latter respect, certainly, they excelled all others on the G. T. R., and many of them were rebuilt at the change of gauge, 5′-6″ to 4′-8½″, in 1873-74. These stolid English locomotives were always remarkable wherever they appeared on the Grand Trunk line, and were especially interesting to American railroad men. They were popularly known by three classes, according to their colour. They were designated as red-cased, green-cased, and black-cased Birkenheads. Their peculiar frontal aspect at once distinguished them, and there were no other engines like them in America.

The early Birkenheads were rather clumsy in appearance, and the introduction of the four-wheel truck under the chimney-seat made them appear even more so. In the later specimens, 1857-58, the side frame was made to curve over the forward drive-wheel and run straight to the cab and over the drivers. They were built on the 4-4-0 principle, too, and they displayed finer workmanship and less obtrusive lines. Their tenders were equipped with double trucks, and, generally they were provided to meet all the conditions unforeseen by their designer in 1854.

THE LAST OF THE BIRKENHEADS.

The last of these once famous locomotives remained in service on the Carillon & Grenville Railway until 1916. This railway formed a short connecting link in the rail and river route from Montreal to Ottawa, and ran between the two towns that

gave it its name, on the north shore of the Ottawa River. It was quite an old road, going back to the fifties, and it retained the old 5'-6" gauge to the end of its days, when it was engulfed in the Canadian National, merger that involved and extinguished the Grand Trunk, Canadian Northern, Intercolonial, Grand Trunk Pacific, and a score of lesser lines, and at one time yawned menacingly and very hungrily at the Canadian Pacific itself. The old Birkenhead, one of two engines that worked the C. & G., was built in 1856. Whether it came direct to the Carillon line from the Canada Works, or through the medium of the Grand Trunk, is uncertain. It bore the name, "Ottawa," on the panel of the cab, and had a mushroom stack. When the merger came the old C. & G. was at once closed and the Ottawa sold for scrap-iron. An effort was made at the time, 1916, by the writer, and by Mr. F. L. Renaud of the Montreal Antiquarian Society, to rescue the old engine from destruction, but the C. N. R. was too engrossed with the business of war and amalgamation to look to preserving a relic it would give the world to possess to-day.

CONTEMPORARY OBSERVATIONS.

As a concluding chapter to our story, we subjoin the extracts from the "LOCOMOTIVE" Magazine, of London, Eng., for which we are indebted to Mr. W. M. Spriggs.

Dec. 15 1925 Vol 31 Page 392

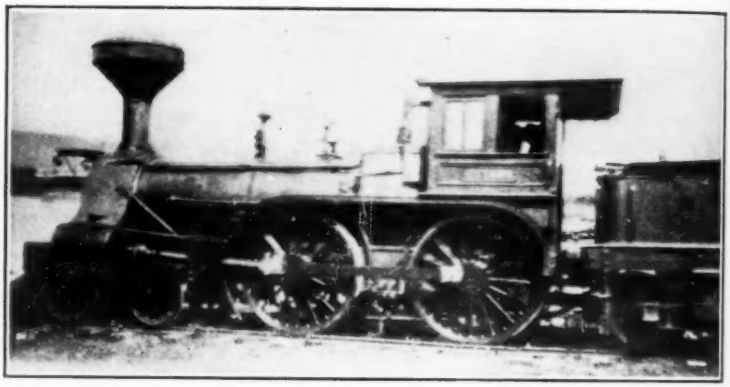
The first locomotives built at the Canada Works, Birkenhead, by Messrs Peto, Betts, Brassey & Johnson, were (No. 1) "Lady Elgin" and (No. 2). "Lord Elgin" for the Grand Trunk Railway of Canada.

They were of the 2-4-0 type with outside cylinders 15in dia. by 20in stroke; the coupled drivers were 6ft. dia. and the leading wheels 3ft 6in dia. The boiler contained 178 1⅞in tubes which provided 872 sq. ft. of heating-surface; the firebox contributed another 78 sq. ft. making a total of 950 sq. ft. The chimney was of the large funnel-shaped spark arresting type and appears to have attracted much notice from those who saw the engines; such a chimney was required as the engines were to burn wood.

The gauge of the Grand Trunk Ry was then 5ft. 6in. No. 1 was tried in steam on May 29th 1854 and No. 2 a few days later. Both were shipped on the Steamship "Ottawa".

A very interesting and historic locomotive is that for the Carillon and Grenville Ry shown on page 242 of Vol 17. The engine has no number that can be seen, but it may be identified by the large mushroom smoke-stack used on wood burners. Mr. Herbert Wallis formerly mechanical superintendent of the Grand Trunk Ry of Canada says of this type of engine:—

"This was one of the locomotives constructed for the Grand Trunk Ry Co. on the lines of those used upon the London and North Western Ry in England, at the Canada Works at Birkenhead, from 1854 to 1858 by Messrs Peto, Brassey, Betts & Jack-



Locomotive "Ottawa" Carillon and Grenville Ry.

When the Carillon & Grenville Railroad was acquired by the Canadian National in 1916, the old "Ottawa" was run on to a siding to await her claimant, a junk dealer of Montreal.
By courtesy of Dr. Albert Halsey of Carillon, P. Q., son of John Halsey, her former Engineer. Per Robert R. Brown, Montreal.

son the contractors for constructing the Grand Trunk Ry. The stroke of the pistons was in every case 20in, but the cylinder diameters were 15, 16 and 17 in, the smaller size having single pairs of driving wheels 6 ft diameter, and the others having four coupled drivers 5 ft in diameter. The boilers were of Lowmoor iron, containing 170 brass tubes 1⅞ in outside diameter, and carried steam pressure at 110 lbs. per sq in. The fireboxes were of copper. The cylinders were set at an angle from the horizontal plane of the driving axle, and were situated outside the

main plate frames and between them and subsidiary frames which extended from the buffer beams to the forward driving wheels. The engine left the makers with single pairs of leading wheels. The Carillon and Grenville machine was a 16 in engine and the latest of its kind. The weight of the engine in working order was about 25 tons, and the gauge of the rails was 5 ft. 6 in. The Carillon and Grenville Ry was operated exclusively in connection with the passenger steamers of the Ottawa River Navigation Co. and was probably the only broad gauge railway in the Dominion a year ago. It was built in 1858, and has recently been converted to standard gauge.

In November 1873, on the Grand Trunk Ry—Sarnia to Buffalo 216 miles from St. Marys to Buffalo were converted from the 5 ft. 6 in. gauge to standard gauge in 18 hours, while at about the same period from Stratford to Montreal 421 miles, with 60 miles of sidings were changed in 24 hours; the lines East of Montreal 542 miles, with 60 miles of sidings were converted during one night September 25-26 1874.

June 15 1916 Vol. 22 Page 116

OLD LOCOMOTIVES WESTERN RY OF FRANCE

It will be remembered that Mr. Buddicom as locomotive superintendent of the Grand Junction Ry, was the first official to have sole charge of the Locomotive Department of that line in 1841, when Mr. Locke the chief engineer, separated that department from the Way and Works.

Whilst he had charge of the Edge Hill Locomotive Works Liverpool 1841 and 1842 Mr. Buddicom built for the Grand Junction Ry, the first engine of the afterwards well known "Crewe" pattern, having outside cylinders with inside bearings for the driving and outside for the carrying wheels, and when he with Mr. Locke left the Ry to take charge of the Locomotive and Engineering Department respectively of the Paris & Rouen Ry in 1842 and founded the Chartreuse works at Rouen, it is not surprising to find he followed the practice (of this design).

Mr. Alexander Allen succeded Mr. Buddicom at Edge Hill, and soon afterwards took charge at the new works at Crewe, and he adhered to this design during the whole period he was connected with the L & N W & afterwards on the Scottish Central Railway.

COMPLETE TABULATED LIST OF FIFTY BIRKENHEAD ENGINES ON G. T. R. COMPILED FROM THE GENERAL LIST, ANNUAL REPORT, 1859.

Eng.	Date of Delivery	Service	Cylinders	Drivers	Weight Tons	Pressure
41	Nov. 1854	Passenger	15x20″	72″	25.5	110
5	Jan. 1855	"	"	"	"	"
6	"	"	"	"	"	"
23	Feb. 1855	"	"	"	23.12	"
42	"	"	"	"	25.5	"
43	Mar. 1855	"	"	"	"	"
44	"	"	"	"	"	"
45	"	"	"	"	23.12	120
46	Apr. 1855	Freight	16x20″	60″	25.12	"
47	May 1855	"	"	"	"	110
65	Nov. 1855	Passenger	15x20″	72″	25.5	120
69	"	"	"	"	"	110
48	Dec. 1855	Freight	16x20″	60″	25.12	"
62	"	"	"	"	"	"
63	"	"	"	"	"	"
67	"	Passenger	15x20″	72″	25.5	"
49	Jan. 1856	Freight	16x20″	60″	25.12	"
50	"	"	"	"	"	"
51	"	"	"	"	"	"
64	"	"	"	"	"	"
66	"	Passenger	15x20″	72″	25.5	"
70	May 1856	"	"	"	23.12	"
74	July 1856	Freight	16x20″	60″	25.12	"
75	"	"	"	"	"	80
76	Sep. 1856	"	"	"	"	110
77	Oct. 1856	"	"	"	"	120
78	"	"	"	"	"	110
79	"	"	"	"	"	"
80	"	"	"	"	"	"
81	"	"	"	"	"	100
82	"	"	"	"	"	110
84	"	"	"	"	"	120
83	Nov. 1856	"	"	"	"	110
85	"	"	"	"	"	100
145	Dec. 1856	"	"	"	"	115
146	"	"	"	"	"	"
52	"	Passenger	15x20″	72″	25.5	120
187	Nov. 1857	Freight	16x20″	60″	25.12	120
188	"	"	"	"	"	"
189	"	"	"	"	"	"
190	"	"	"	"	"	"
191	Dec. 1857	"	17x22″	"	26.16	110
192	"	"	"	"	"	"
193	"	"	"	"	"	"
194	"	"	"	"	"	"
57	Nov. 1858	"	16x20″	"	25.12	120
58	"	"	"	"	"	"
59	"	"	"	"	"	110
60	"	"	"	"	"	"
61	"	"	"	"	"	100

Historical Notes on Locomotive Design.

IV—Modern Improvements in Construction.

By E. G. Young

As has been said, the locomotive of 1890 was the same machine in theory essentially as that of 1840, but during the last twenty-five years important differences in principles have been adopted (and in some cases discarded,) as well as a large number of minor improvements in construction. The first compound engine in the United States was imported from England about 1885; it was of the Webb three-cylinder type. In 1889 the first practical American compound was built by the Baldwin works for the Baltimore and Ohio. This was of the type later termed the "Vauclain Compound"; it had a high-pressure and a low-pressure cylinder on each side, one above the other: these had separate pistons acting on the same crosshead and main rod. (For diagrams of this and other types of compounding referred to see Figs. 72, 73, 74, and 75.) This was shortly followed by the introduction of the two-cylinder or cross-compound, also known by several other names, as there were many differences of detail in the engines built by the various designers, and each bore the name of its sponsor or builder. This type of engine has the high-pressure cylinder on one side of the engine, and the low-pressure opposite. In 1893 the "tandem" type was produced, though very few of these were built until after 1900. This form has four cylinders, a high and a low-pressure on either side, with a continuous piston rod through the two. In 1903 the "balanced" type was brought out, with the two high-pressure cylinders between the frames driving a crank-axle, and the two low-pressure cylinders outside driving the crank-pins as in the normal engine.

There is no question as to the economy of the compound engine, especially in freight service, but the complications introduced form a serious argument against it. For twenty years the fight for and against the compound was fierce, and then the advocates of compounding lost, because of the advent of a simpler means of producing the same saving—the superheater. It has been proved that very little gain results from the use of the two devices in combination. The balanced compound and the Mallet type alone survive: the former because of the smooth-running qualities of the engine at high speed, due to excellent

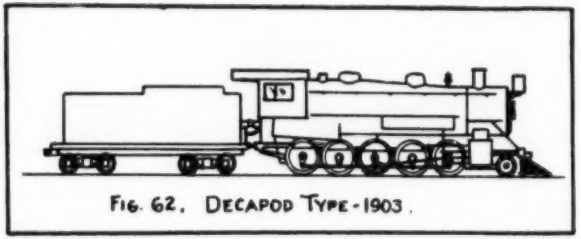


FIG. 62. DECAPOD TYPE - 1903.

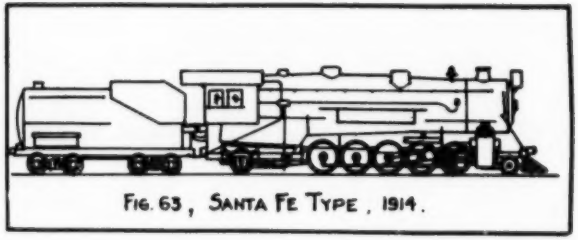


FIG. 63, SANTA FE TYPE, 1914.

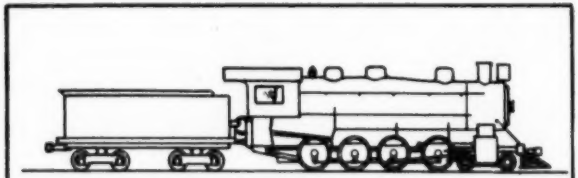


FIG. 64. TWELVE-WHEEL TYPE, 1900.

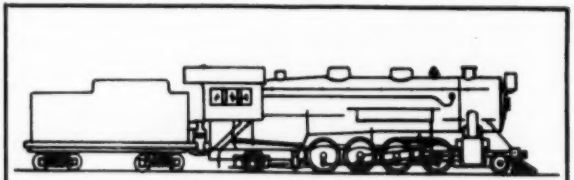


FIG. 65. MIKADO TYPE, 1912

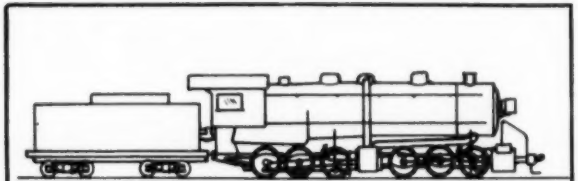


FIG. 66, MALLET TYPE (0-6-6-0), 1904.

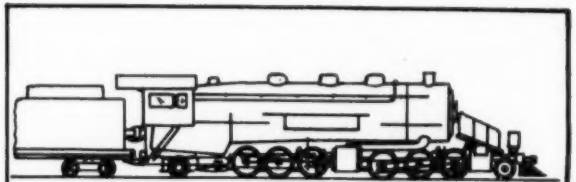


FIG. 67, MALLET TYPE (2-6-6-2) - 1908

mechanical balance; the latter because of the very high hauling capacity made possible.

The superheater is a device for raising the temperature of the steam before it passes into the cylinders. The products of combustion are more economically used, and in the action of the steam itself, two savings are introduced: a given weight of steam containing more heat is able to do more work; the loss due to cylinder condensation is almost entirely prevented on account of the high temperature which can be maintained in the cylinder-walls. Two methods of superheating have been in common use: the smoke-box type and the firetube type. In the former, the steam-pipes in the smoke-box were lengthened and divided into a grid of small tubes, among which the hot front-end gases freely circulate. In the latter type, which is now in general use, the steam passes from the dry-pipe into a header, and is then led back through a number of small tubes toward the firebox; the small tubes containing the steam traverse large flues through which the hot gases pass. The small tubes end in another header, from which steam-pipes run directly to the cylinders. This type of superheater is now being built into practically every locomotive built for road-service.

In 1904 the American Locomotive Co. adopted the Mallet principle, well known in Europe, of placing two sets of drivers and cylinders under the boiler, using the same steam for both cylinders. This produces an engine of complicated construction, but of very great power. Fig. 66 shows the first engines of the type, built for the Baltimore and Ohio. In the next six or seven years the builders and the railroads extended the principle in spectacular style: the "largest-in-the-world" fever was epidemic, and the two or three times in each year the records for weight and power were broken. Mallets were built for freight and switching traffic, and even tried in passenger service. The disadvantages of complication, excessive weight, strain on track and structures, and their abuse of cars checked the further spread of the type, and for a time very few were built. The last two years have brought a new lease of life to the Mallet. At present writing they are being built literally by the hundreds. The latest extension of the Mallet principle is the Erie "Triple," built by the Baldwin works, in which the number of complete engines is three, the third set utilizing the weight of the tender and its load of adhesion. (See Figs. 67, 68, 69.)

In the past few years, many details have received more than

FIG. 67, MALLET TYPE (2-6-6-2) - 1908

FIG. 66, MALLET TYPE (0-6-6-0), 1904.

the former care in design. Notable among these are the improved valve-gears, the Walschaerts and Baker gears predominating in present construction. The wide firebox is almost universal in application; the slide-valve has been superseded by the piston valve; the reverse-lever has in many cases been supplanted by the power-reverse, operated by air or steam, or a screw-reverse operated by a hand-wheel. The automatic stoker has been developed to a practicable point, and its use is spreading on the heaviest power. The burning of liquid fuel is satisfactorily accomplished, and fireboxes are in use capable of burning coal which is little better than dirt. The brick arch in the fire-box as a means of increasing the length of the flameway is in common use, and the use of water-tubes to support it provide additional and very efficient heating surface. Experiments are in progress looking toward the use of a larger area of firebox water-tubes. Even the tender has seen great changes: at present the cylindrical tank with the coal box on top—the "Vanderbilt" tender—is popular.

V. Current Practice.

At present writing, four types of locomotives dominate the builders' orders. These are the Pacific, for passenger service; for yard service, the six-wheeled switcher; for freight traffic, the Mikado and the Consolidation. Where the demands of the service are extreme, there is a tendency toward the Mountain type for passenger-hauls, and the Santa Fe in freight service. In "hump" or gravity yards, and in those where the yard engines must handle full road-tonnage the eight-coupled switcher is general, and the present situation of congested terminals renders this type of increasing importance.

In conclusion, it should be noted that the slogan of today is "modernize." Since a locomotive is really rebuilt on the average of once in two years, under ordinary conditions a life of twenty to twenty-five years is expected. It follows that of 20 to 25 years is expected. It follows that of the sixty-odd thousand engines in the United States a large number can not be considered as "modern." Actually the builders figures show that only about one-third of the number have been built since the beginning of 1910—with the present demand for maximum service from every unit of power, the remaining two-thirds fall into the "slacker" class. Methods of modernizing are advo-

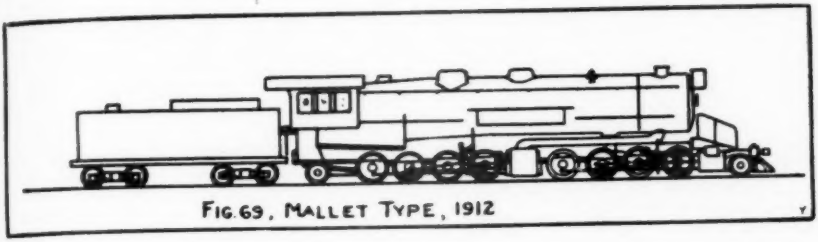


FIG. 69, MALLET TYPE, 1912

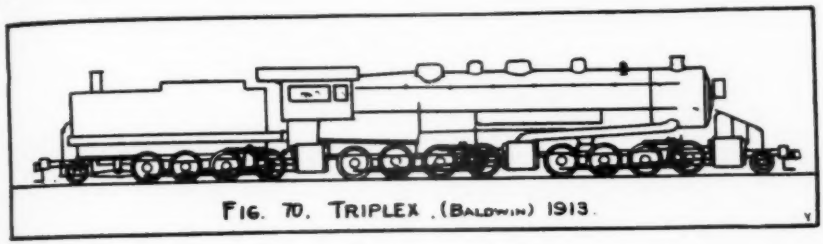


FIG. 70. TRIPLEX. (BALDWIN) 1913.

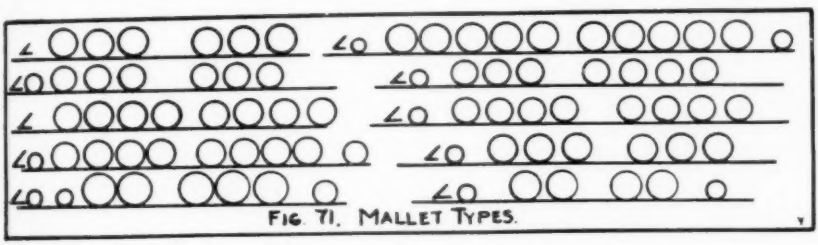


FIG. 71. MALLET TYPES.

FIG. 72 CROSS-COMPOUND

FIG 73 BALANCED COMPOUND

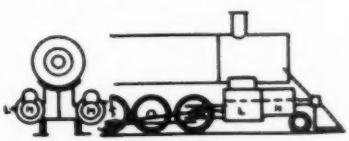


FIG. 74 TANDEM COMPOUND

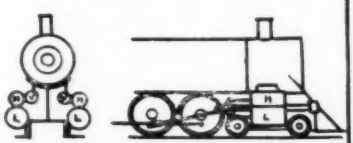


FIG 75 VAUCLAIN COMPOUND

cated in the pages of every railway journal, but the following may be mentioned as those most in favor: the installation of superheaters; change from slide to piston valves; application of outside valve gears, brick arches in the fire-boxes,—these changes are warranted on all locomotives which are or may be put in serviceable condition. Such a "modernized" locomotive can be truly said to be a better machine than when it was new, though it is not often that it may be considered as good as an engine of today with such improvements basic parts of the design.

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"LOCOMOTIVES OF THE NINETEENTH AND TWENTIETH CENTURIES"—S. M. Vauclain.

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Special attention is given heavy modern types.

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"ALL ABOUT RAILWAYS"—F. S. HARTNELL, (London 1913)
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THE 1887 EDITION OF THE CATALOG OF THE ROGERS' LOCOMOTIVE WORKS. (Material compiled by M. N. FORNEY).
The same, published in installments in the "American Engineer," Vol. i, new series, 1887.
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"THE EVOLUTION OF THE STEAM LOCOMOTIVE"—W. A. DOBLE.
Proc. Pacific Coast Ry. Club, Sept. 16, 1905.
Notes on the Baltimore and Ohio exhibit at St. Louis: much historical matter and many photographs.

"DEVELOPMENT OF THE LOCOMOTIVE ENGINE"—A. SINCLAIR (1907).
A very complete general history of the locomotive in America, with some attention to foreign practice as well. Well illustrated. Would be more convenient for use if arranged chronologically.

EDITOR'S NOTE—This article concludes the series of three articles on this subject by Mr. Young.

The New Castle Manufacturing Company

Reprinted from the pages of Railway and Locomotive Engineering, January, 1922, Issue.

By J. Snowden Bell

The New Castle Manufacturing Company, of New Castle, Del., was one of the earliest locomotive builders in the United States, and during its operation, which extended over a period of more than twenty years, the character and extent of its product were such as to merit a fuller recognition of its place in the development of the American locomotive than it would appear to have received. As in the case of other early locomotive builders, its records and drawings have long since disappeared, and few of those who had personal knowledge and recollection of its work are now living. The work of the reviewer must therefore be necessarily limited to the presentation of such scattered data bearing upon it as have resulted from his research.

The earliest mention which has been found, in a publication, of the New Castle Manufacturing Company, appears in the "*Report upon the Locomotive Engine and the Police and Management of several of the principal Railroads of the Northern and Eastern States,*" by J. Knight, chief engineer, and Benjamin H. Latrobe, engineer of location and construction, Baltimore & Ohio Railroad, Baltimore, 1838. The report is dated, May 14, 1838, and in the section referring to the New Castle & Frenchtown R. R., the following statement is made (p. 33):

"The company had their engines repaired at a shop of their own in New Castle, until the last few months, within which time the repairs have been executed at the engine manufactory of the New Castle Company."

The New Castle & Frenchtown Railroad extended from New Castle, on the Delaware River, to Frenchtown, on the Elk River, a tributary of Chesapeake Bay, a distance of about 16 miles, and was intended to form "part of the great highway between the cities of Philadelphia and Baltimore." The road was opened with a single track in February, 1832. It was for some years thereafter operated in connection with steamboats between Philadelphia and New Castle, and between Frenchtown and Baltimore, the trip occupying from 7 o'clock A. M., to "an early hour in the afternoon," as indefinitely stated in a newspaper advertisement of March, 1834.

The New Castle and Frenchtown Railroad is stated to have been "one of the first railroads in the United States to make regular passenger movements in cars drawn by locomotive engine power." In the report of Knight and Latrobe before referred to, the company is said to have then had six locomotives, a list of which is given on page 34, five having been made by Robert Stephenson, of Newcastle, England, and one by E. A. G. Young, of New Castle. The first of the Stephenson engines, which was operated on the opening of the road, is briefly des-

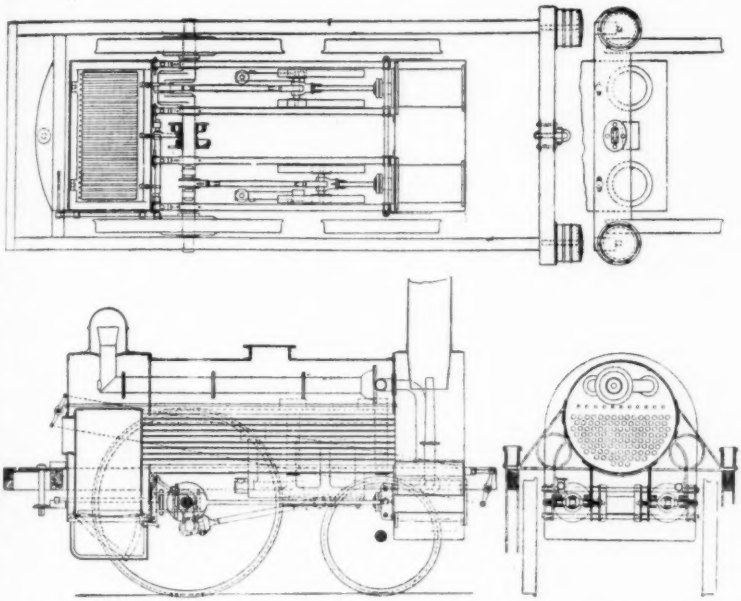


Fig. 1.—Locomotive Built By Robert Stephenson For The New Castle & Frenchtown Railroad.

cribed in Wood's "*Practical Treatise on Railroads,*" First American edition, Philadelphia, 1832, as follows:

"A locomotive engine of the latest pattern (made by Robert Stevenson, of Newcastle-upon, Tyne, England, has been imported by the company. The spokes of the wheel are wrought-iron *tubes,* bell-shaped at their extremities; the rim and hub cast on them—the union being effected by means of borax. The wheels are encircled by a wrought-iron *tire* and flange—the latter

is very diminutive, and will require enlargement. The weight of the engine is not adapted to a railway of slender proportions composed of timber and light rails" (page 532).

The accompanying illustration, Fig. 1, is a reduced reproduction of a print which was furnished to the writer by Messrs. Robert Stephenson & Co., Ltd., Darlington, England, and is believed by them to represent the first locomotive built by Robert Stephenson for the New Castle & Frenchtown Railroad.

The letter which accompanied the print gives the following particulars of the locomotive, viz.:

Makers No. 23. Ordered, 2nd Janr. 1831, sent away 1st Oct. Boiler diam. 8′—0″, length, 6′—6″, No. of tubes, 97. Firebox, 2′—2″ long. Wheels, Fore 3′—1″. Aft, 5′—0″. Centre & Centre, 5′—2″. Width of Ry. 4′—8½″. Cylinders, Diam. 11″, stroke, 16″. Frame, Breadth, 6′—3″, length, 15′—1½″. Cranked Axle, 4 ins. diam. in the centre part and bearings just outside of the cranks. Crank Pin, 3⅞″; End Bearing, 3″ diam. and 6″ long; 8 inch cranks, 2′—7″ centre and centre. Plain axle 3½″ diameter.

Knight and Latrobe's report states that the weight of this locomotive was 9 tons, of which 6 tons was on the driving wheels, and gives the following particulars of the Stephenson engines of the New Castle and Frenchtown Railroad:

"The cylindrical part of the boilers of these engines is of plate 7/16 inches in thickness. The boiler heads are of ½ inch plates, and the copper of the tubes is 1/16 in. thickness. The working effective steam pressure in the boiler is said to be 75 lbs. per square inch."

It is further stated that "one cord of wood is consumed by a passenger engine in a circular trip of 33 miles, inclusive of that burnt in lighting up the fire, and raising the steam, and in waiting upon the steam boats."

These locomotives are of interest as illustrating the English practice of their early date, which was substantially duplicated in the "Old Iron-sides" built by M. W. Baldwin, of Philadelphia, in 1832, the Locks and Canals Co. of Lowell, Mass., and other manufacturers in this country, whose operations began about that time. Cranked axles were then practically universal, and it is probable that they were fitted in the first locomotives built by the New Castle Manufacturing Company.

Edward A. G. Young, of New Castle, who was the maker of one of the locomotives (the "New Castle"), listed in Knight and Latrobe's report as being in service on the New Castle & French-

town Railroad, in 1838, had been building locomotives at New Castle, for some years earlier, and seems to have been favorably known at that time. In the description of the Allegheny Portage Railroad, a part of the original Maine Line of the public works of the State of Pennsylvania, which appears in William Bender Wilson's *History of the Pennsylvania Railroad Company*, Philadelphia, 1899, it is stated (vol. 1, p. 122), that two of the three locomotives, which were ready for service on the opening of the road for the movement of traffic in the season of 1835, were the "Delaware" and "Allegheny," which were built by Edward A. G. Young. Regarding these engines, it is further stated that they—

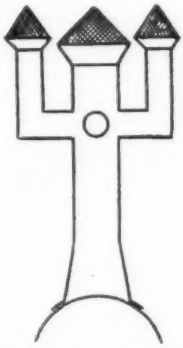


Fig. 2.—Young Patent Of 1833. A Device For Preventing Emission of Sparks.

"reached Holidaysburg, April 15, 1835, and were sent to Johnstown where the parts were fitted together and the necessary alterations made at an ordinary blacksmith's shop, there being no machine shop in operation at the time. Their contract price was $5,500 each, and it cost $158 additional per locomotive to transport them from Philadelphia to Holidaysburg. The builder had had several years' experience in the use of locomotive engines."

No description of these locomotives is given other than that the "Delaware" had a crank axle, and it is probable that both of them, as well as the "New Castle," were built on the general plan of the Stephenson locomotives shown in Fig. 1.

The only other matter that the writer has been able to develop as to E. A. G. Young is that a Patent was granted to him July 22, 1833, for "Preventing the emission of Sparks from the

'Chimney of Locomotives or other steam Engines.' " This Patent was among those that were destroyed in the Patent Office fire of 1836, and were not restored, and therefore no record of it is available. The following brief notice of it, however, appears in the *Journal of the Franklin Institute,* Vol. XIII., N. S. 1834, p. 36, from which, and the accompanying diagrammatic illustration, Fig. 2, the design can be understood:

"The main flue is to be covered with fine wire gauze, and there are to be four, or any other number of, additional flues, which may proceed from the upper part of the main flue, and be elbowed so as to have their mouths upwards; these also are to be covered with wire gauze, allowing the smoke to pass, and detaining the sparks."

The Young spark arresters were in service on the New Castle & Frenchtown Railroad. The elbowed arms were removed, at intervals, to be cleaned, the engine being pushed near an overhanging platform for the purpose.

As appears from the report of Knight and Latrobe, the New Castle Manufacturing Company had its engine manufactory in New Castle in operation, at least a "few months" prior to the date of that report, May 21, 1838, and the writer believes that this manufactory was that which had previously been operated by E. A. G. Young, although no record evidence to that effect seems to be obtainable.

The New Castle Manufacturing Company was incorporated by the Legislature of Delaware on June 25, 1833. It is curious that the first section of the Act reads: "Be it enacted . . . . that a company shall be established for the purpose of carrying on the manufacture of cotton, wool, grain, plaster of Paris and other materials, in or near the town of New Castle," etc. This evidences how little the industrial future was appreciated at that date. Mr. Andrew C. Gray, then a young lawyer, practicing in New Castle, became interested as a subscriber to the stock of the company, and about 1840, or shortly thereafter, was elected its President, occupying that position throughout its operation which continued until about 1859. Mr. Gray afterwards became a director and president of the New Castle & Frenchtown Railroad, and he was the father of the eminent jurist, Hon. George Gray, now of Wilmington, Del., whose public services have caused him to be known as Delaware's foremost citizen. Judge Gray personally stated to the writer that he remembered seeing, when a boy the old Stephenson locomotives of the New Castle

& Frenchtown Railroad, and his recollection of the design and performance of the later engines built by the New Castle Manufacturing Company is remarkably clear and accurate.

The official records of the New Castle Manufacturing Company not being available for reference, even if still in existence, which is doubtful, a complete history of the company's manufacture would be impossible, and even a general reference thereto, imperfect and insufficient, being dependent wholly upon the recollection of the reviewer and the extent to which he has been aided by publications in which the work of the Company has been referred to. From these sources the following is presented,

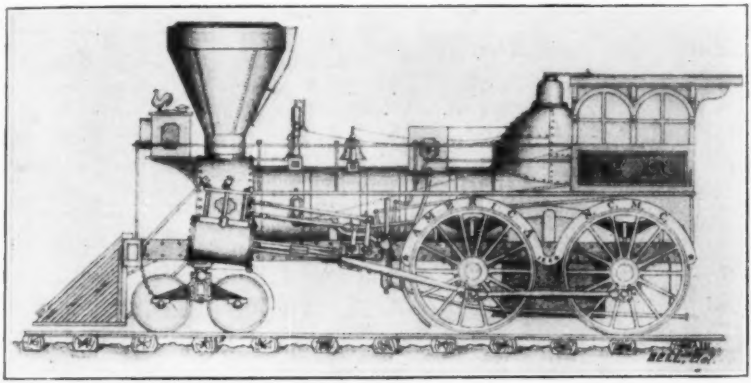


Fig. 3.—Locomotive "America" Built For The Philadelphia, Wilmington & Baltimore Railroad In 1854.

as comprising all the data that the writer has found it possible to develop:

The first locomotive made by the New Castle Manufacturing Co. that has been found of record is the "Arrow," No. 28, built for the Baltimore & Ohio, R. R., and put in service February, 1840. The only reference to this locomotive is the statement in the Twenty-fourth Annual Report of the road, 1850, that "Engine 'Arrow' had new crank shaft, new truck frame, etc." This engine being thus shown to be inside connected, differs from four others subsequently built for the same road by the New Castle Manufacturing Co. these being the "New Castle," No. 47, December, 1846; "Delaware," No. 48, January, 1847; No. 122,

December, 1852, and No. 164, July, 1853. These four engines were all of the New Castle Co.'s standard design of the "American" (4-4-0) type.

Thatcher Perkins, Master of Machinery of the Baltimore & Ohio R. R., designed an eight coupled (0-8-0) locomotive, the "Hero," No. 54, which was built at the company's Mount Clare shops in Baltimore, and placed on the road in May, 1848. Five more locomotives of this special design were built in outside shops, two of them, the "Saturn," No. 56, and "Memnon," No. 57, by the New Castle Co. in June and October, 1848, respectively.

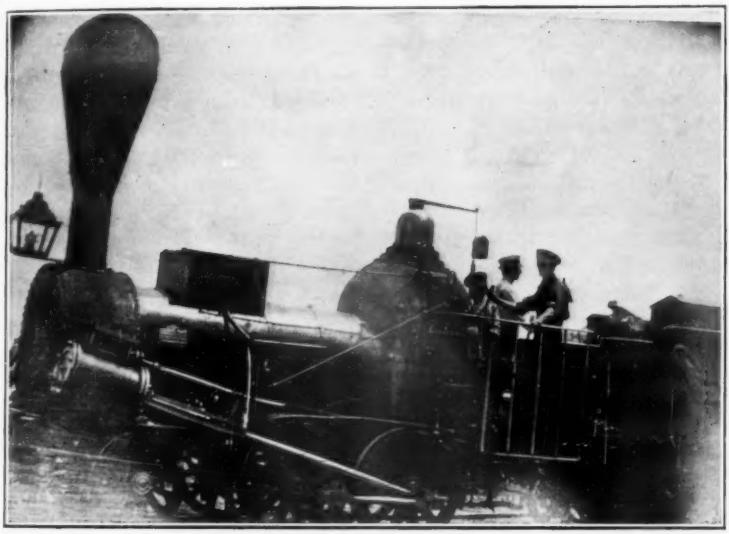
Samuel J. Hayes, then Master of Machinery of the same road, designed a class of locomotives (4-6-0) known as the "Hayes ten wheelers," the first of which was put in service in May, 1853. One locomotive of this design, No. 139, was built by the New Castle Co. and put in service in May, 1853.

In 1863, a locomotive of this company's build, the "Virginia," No. 1, was sent to the B. & O. R. R. Co.'s Mount Clare shops, and was scrapped. It is believed that this engine came from the Hempfield Railroad, which then extended from Wheeling to Washington, Pa.

Up to that year 1861, almost the entire locomotive equipment of the Philadelphia, Wilmington & Baltimore Railroad had been constructed by the New Castle Manufacturing Company, 19 of the 32 locomotives on the road at the close of the fiscal year, October 31, 1861, being listed, with their dates, in Wilson's *History of the Pennsylvania Railroad Company*, Vol. 1, pp. 323-324, and stated to have been built by that Company. These locomotives were the "Victory," 1847; "Boston," 1848; "Delaware," 1851; "Philadelphia," 1852; "New Castle," 1852; "Wilmington," 1852; "Cincinnati," 1853; "Maryland," 1853; "Samson," 1853; "Goliah," 1853; "Pennsylvania," 1853; "America," 1854; "Constitution," 1854; "C. W. Morris," 1854; "Virginia," 1854; "William Penn," 1855; "Thomas Clayton," 1857; and "Princess Anne," 1858. Investigation of the old reports of the Philadelphia, Wilmington & Baltimore R. R. Co., develops five more locomotives that were built by the New Castle Manufacturing Company, and were in service on that road, these being the "Orion," 1846; "Meteor," 1849; "Minerva," 1849; "Union," 1851, and "United States," 1851.

It will, therefore, appear that 25 of 28 locomotives which the P., W. & B. R. R. had in service prior to 1858, were built by

the New Castle Manufacturing Company. Two of the other three, the "Empire" and "Magnolia," were built by the P.,W. & B. R. R. Co., and were in substantial accordance with the standard design of the New Castle Company, as embodied in the 20 locomotives specified above. The characteristic features of this design will be recalled to those who were familiar with it by reference to Fig. 3, which is a reproduction of a hand sketch, made



The "Ontalaunee" First Engine On The New London Northern R. R. and Built By Young At New Castle.

by the writer many years ago, of the P., W. & B. R. R. locomotive "America." While the drawing was not made to scale, its proportions are approximately correct.

As shown in the illustration, the standard "American," or 4-4-0 type design of the New Castle Manuacturing Company, embodied a boiler, the firebox of which had a hemispherical or "Bury" dome at its top; combined wooden and iron plate frames; a truck, having closely set axles and springs which formed its side frame members and were connected at their ends to the journal boxes; inclined cylinders, set entirely above the

truck wheels; main distribution valves operated by hook motion; and independent cut off valves.

The following details of the "America" are of record, viz.: Weight, 51,000 lbs.; weight on driving wheels, 35,500 lbs.; diameter of driving wheels, 66 inches; diameter of cylinders, 17 inches; stroke, 22 inches; weight of tender, 35,510 lbs. It will be observed that the locomotive was a comparatively large one, at its early date, 1854, and it is stated that it was run on what was called the "Lightning Train" between Philadelphia and Baltimore.

It is much to be regretted that the loss or destruction of records, and the passing away of those whose recollection might supplement them, have limited the narration of the career of the New Castle Manufacturing Company to the imperfect and fragmentary matter which is here presented. The work of the Company fully entitled it to honorable mention in the history of American locomotive engineering, and to a much more complete and detailed description than it has been possible for the writer to make.

In connection with Mr. Bell's article on "The New Castle Manufacturing Company," it may not be amiss to reproduce a roster of Philadelphia, Wilmington & Baltimore R. R. locomotives for 1851.

PHILADELPHIA, WILMINGTON & BALTIMORE R. R.

Engines in Service in 1851. First complete Report.

John Bull	English	11 x18″	?		
Lafayette	Norris	10½x18″	50″	28000	Rebuilt by PW&B
Susquehanna	"	10½x18″	50″	20000	
Gunpowder	"	10⅝x18″	50″	28000	Rebuilt by PW&B
Schuylkill	"	10⅝x20″	50″	32000	" " "
Washington	"	10½x19″	63″	49170	" " "
3 Cylinder, Inside 15x20″					
Kentucky	Norris	10½x18″	48″	31000	" " "
Brantz	"	10½x18″	50″	32000	" " "
Christiana	"	12 x26″	72″	49150	" " Elliott
& Houston, Wilmington					
Rough & Ready	Baldwin	12 x18″	50″	36490	" " Elliott
& Houston, Wilmington					
Brandywine	Baldwin	12½x21″	63″	35000	Rebuilt by PW&B
Hercules	New Castle	?	?	?	
Harrison	Baldwin	14⅜x20″	63″	42000	Rebuilt by Betts,
Harlan & Hollingsworth					
Ohio	Norris	12½x21″	72″	55120	Rebuilt by PW&B.
3 Cylinder Inside 15x21″					
Orion	New Castle	13 x20″	56″	40790	
Victory	"	14½x20″	60″	38830	
Mississippi	"	14⅜x20″	60″	41200	
Minerva	"	15 x20″	66″	41950	
Boston	"	14½x20″	60″	40600	

Canton	P. W. & B. R. R.	12½	x21″	63″	45000
Baltimore	"	13	x24″	63″	38000
President	"	14	x21″	63″	44370
Empire	"	14	x26″	72″	?
Delaware	New Castle	15	x20″	66″	42000
Union	"	15	x20″	62″	42000

Five years later, 1855, only twelve of the above engines appear on their locomotive roster.

An examination of over two hundred locomotive rosters indicates where some of the locomotives built either by Mr. Young or the New Castle Manufacturing Co. were delivered, and while this list is not to be considered as conclusive, it will give fairly accurately where the majority of the locomotives were in service.

Built by Mr. E. A. G. Young.

1832

Philadelphia, Norristown & Germantown R. R. "Sampson".

1833

Allegheny Portage R. R. "Delaware".
" " "Tennessee".

1834

Allegheny Portage R. R. "Allegheny".
New Castle & Frenchtown R. R. "New Castle".

1835

Philadelphia, Norristown & Germantown R. R. "Arrow".
Philadelphia & Columbia R. R. "Columbus".

1836

Boston & Providence R. R. "Young #1".
" "Young #2".
Richmond, Fredericksburg & Potomac R. R. "American".
Nashville & New Orleans R. R. ".....".
Allegheny Portage R. R. "Comet".
Philadelphia & Columbia R. R. "Planet".
" "Comet".

1838

Philadelphia & Wilmington R. R. "New Castle".
Baltimore & Ohio R. R. "New Castle".

New Castle Manufacturing Co.

1840

Baltimore & Ohio R. R. "Arrow".

1842

Philadelphia & Reading R. R. "Monocacy".
" "Pottsville".
" "Tuscarora".

1843

Eastern R. R. "Shawmut".
Philadelphia & Reading R. R. "Pennsylvania".
" "Ontalaunee".

1844

Philadelphia & Reading R. R. "Columbus".
Connecticut River R. R. "Cabot".
" " " "Chicopee".

1845

Philadelphia Wilmington & Baltimore R. R. "Hercules".

1846

Baltimore & Ohio R. R. "New Castle".
Baltimore & Susquehanna R. R. "George Winchester".
Philadelphia & Reading R. R. "Carolina".
" "Missouri".
Philadelphia, Wilmington & Baltimore R. R. "Orion".

1847

Baltimore & Ohio R. R. "Delaware".
Central R. R. & Banking Co. of Georgia "General Scott".
" "General Twiggs".
New Castle & Frenchtown R. R. "Delaware".
" "Virginia".
Philadelphia, Wilmington & Baltimore R. R. "Victory".

1848

Connecticut River R. R., "Montreal".
Baltimore & Ohio R. R. "Saturn".
" "Memmon".
Camden & Amboy R. R. #20.
" #27.
Philadelphia, Wilmington & Baltimore R. R. "Mississippi".
" "Boston".

1849

Philadelphia, Wilmington & Baltimore R. R. "Minerva".
" "Meteor".
Vermont Central R. R. "Spit Fire".

1851

Hudson River R. R. "Priam".
" " "Potomac".
Philadelphia, Wilmington & Baltimore R. R. "Union".
" "United States".
" "Delaware".
South Carolina Canal & R. R. Co. "James L. Petigru"—Exploded in 1851.

1852

Baltimore & Ohio R. R. #122.
Philadelphia, Wilmington & Baltimore R. R. "Wilmington".
" "Philadelphia".
" "New Castle".
Seaboard & Roanoke R. R. "Raleigh".
South Carolina Canal & R. R. Co. "James L. Petigru".
" "Edward Carew".

1853

Baltimore & Ohio R. R. #139.
" #164.
Philadelphia, Wilmington & Baltimore R. R. "Cincinnati".
" "Goliah".
" "Maryland".
" "Pennsylvania".
" "Samson".

1854

Philadelphia, Wilmington & Baltimore R. R. "America".
" "Constitution".
" "C. W. Morris, Jr."
" "Virginia".
South Side R. R. of Virginia "Cumberland".

1855

Philadelphia, Wilmington & Baltimore R. R. "William Penn".

1857

Philadelphia, Wilmington & Baltimore R. R. "Thomas Clayton".

1858

Philadelphia, Wilmington & Baltimore R. R. "Princess Anne".

There were doubtless additional engines built at this plant but as the records have long ago disappeared, we can resort only to such locomotive rosters as are in our possession.

The reproduction of the locomotive "Ontalaunee" that appears with this sketch was found by one of our members and is reported to have been the first locomotive on the New London Northern R. R. and used in the construction of that road. From what information that is available, it would appear it was not the locomotive on the Philadelphia & Reading R. R. sent to this road, but one of the Young engines from the Boston & Providence R. R. Can any of our members give us additional information concerning this early locomotive?

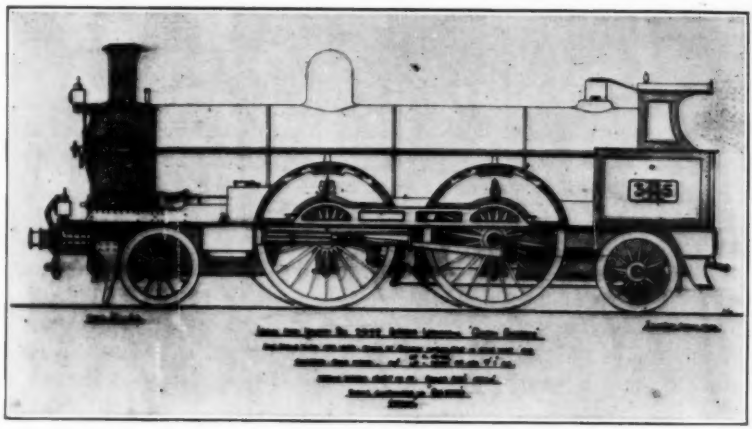
CHARLES E. FISHER.

The London and North Western Railway Locomotive "Queen Empress".

By John W. Smith.

In a former short article the writer described the British-built 4-cylinder locomotive "James Toleman", exhibited at the World's Fair, Chicago, in 1893. The engine was also illustrated by a line drawing.

In view of this, it seemed fitting also to describe, by a companion article, the L. & N. W. R. 2-2-2-2 3-cylinder express locomotive "Queen Empress", sent over to the same Fair, and



Drawn by J. W. Smith

L. & N. W. Ry "Queen Empress"

notable (till the advent of the G. W. R. "King George V" at the Baltimore & Ohio R. R. Centenary of 1927) as being one of the few British-built locomotives to haul a passenger train in America in modern times.

Prior to the advent of the "Greater Britain" class-of which the "Queen Empress" was an example in a class of ten engines—the L. & N. W. R. had always preferred the 2-4-0 wheel arrangement, coupled in the case of the simples and uncoupled in the case of the compounds, so that the latter were more exactly described as 2-2-2-0 locomotives.

Mr. F. W. Webb, then chief at Crewe, had a strong preference for compounds, and in spite of severe engineering criticism in the technical press of the period, and from other sources, rigorously adhered to this method during his long term of office. Consequently "F. W. Webb's system" obtained a notoriety not related to the excellence of its arrangements so much as to the attention drawn to the locomotives themselves and the good work they accomplished, though severely handicapped in other ways.

Contemporary with the "James Toleman" they had some general features in common, though the parallel must not be pressed too closely. To illustrate, both had special boilers, multi-cylinders, and large uncoupled driving wheels. There was less of the "freak", however, about the Webb engine, than in Winby's design. So far as the Webb engine was concerned, it is possible that with coupling rods across the drivers, and a boiler minus the combustion chamber, the engines might have performed better.

All were constructed at Crewe Works, from 1891 onwards, the trial trip of the first, "Greater Britain", taking place on Sunday, Nov. 4th. of that year, between London and Crewe, 158½ miles, when the locomotive hauled 25 empty 6-wheeled coaches at an average speed of 44½ miles per hour. In view of the light weight of trains in those days, this was a performance.

The total mileage run by this class to Feb. 1899, was 2,704,-537 miles. The coal consumption, including 1.2 lbs. for lighting up, etc., averaged 38.7lbs. per mile per engine. To the end of 1904, the "Queen Empress" had run 473,759 miles, a very considerable total.

For the heavier Northern Division of the L. & N. W. R., there were constructed the "John Hick" class, which were similar, save that they had 6′-3″ drivers. They were not a great success in service, and they were heavy on coal, averaging 44.5 lbs. per mile per engine. It is fair to remark however, that the Northern Division is difficult, and calls for heavy locomotive work over the Westmorland hills, including the famous "Shap Summit".

The choice of the 2-4-2, or more exactly the 2-2-2-2-arrangement, was because a weight restriction of about 15 tons was imposed by the Engineering Department. The following extract from F. W. Webb's paper on "Compound Locomotives", printed in "Engineering" for 1899, makes things clear: "Drivers

placed in front of firebox, in order to obtain a more efficient distribution of weight on the driving wheels''. As the weight did not exceed 15.2 tons per axle, the result seems to have been achieved.

The leading features of the class are set out below:

Leading wheels: 4′ 1½″ diameter.
Driving wheels 7′ 1″ diameter.
Trailing wheels 4′ 1½″ diameter.
Wheelbase: Leading to Driving: 8′ 5″.
Driving Centers: 8′ 3″.
Driving to Trailing: 7′ 0″.
Total: 23′ 8″.
Length of frames (steel plate): 32′ 5¼″ over buffer plates.
The cylinders, three in number, were dimensioned as follows:
H. P.-2-15x24.
L. P.-1-30x24.

The valve gear chosen was Stephenson's motion for the H. P. group, with a shifting eccentric for the L. P. cylinder. The efficiency of the engines must have suffered from this, as no alteration of cut-off was possible for the L. P. over any range of working. In consequence, at times the H. P. engines must have had more to do than was their normal share.

The boiler 18′ 6″ long, had its center 7′ 10½″ above the rails. The diameter measured 4′ 3″. To the top of the chimney was 13′ 1½″ above the rails. A combustion chamber divided the tubes into two lengths, the first group being 10′ 1″ long and the rear 5′ 10″. The heating surface was made up as follows (in sq. ft.):

Firebox: 120.6.
Combustion chamber: 30.1.
Tubes, front: 853.
Tubes, back: 493.
Total: 1505.7.

Steam pressure, 175 lbs, per sq. in.. The weight of the class scaled at 52 tons 2 cwt. for the locomotive, and 25 tons for the tender, total 77 tons 2 cwt.

When on exhibition at the Fair the number of the ''Queen Empress'' appears to have been 3435, but this was later changed to 2054.

The following list gives all the locomotives of the class with dates, and their numbers and names, as carried about the year 1900:

525 Princess May, May, 1894.
526 Scottish Chief, May, 1894.
527 Henry Bessemer, May, 1894.
528 Richard Moon, May, 1894.
772 Richard Trevithick, May, 1894.
776 William Cawkwell, May, 1894.
2051 George Findley, April, 1894.
2052 Prince George, May, 1894.
2053 Greater Britain, Oct., 1891.
2054 Queen Empress, May, 1893.

At Queen Victoria's Diamond Jubilee, in 1897, both the "Queen Empress" and the "Greater Britain" were specially painted, the livery being as follows:

"Greater Britain"—Scarlet, with bands around boiler of purple edged with fluted brass. The panel plates and tender, etc., had gold lines edged with purple. The wheels were purple with white outer faces and tyres. The splashers carried the Royal coat-of-arms and the L. & N. W. R. crest respectively.
"Queen Empress"—white, with bands round boiler of grey edged with brass. The lining and wheels were similar to the "Greater Britain". The tender carried diagrams of a Bury locomotive of 1837 and the "Queen Empress".

The standard color of the L. & N. W. R. locomotives was black, with names on brass plates on the splashers. The numbers were on the cab in brass on a red base. They looked very effective. There were also added to the compound engines concerned the words "F. W. Webb's system", on the name plates.

In these days of large modern locomotives, the doings of other days are likely to be overlooked, and for that reason it is well to recall what was current practice towards the end of last century.

The ash hopper, distinguished between the spokes of the leading driver, is of interest, as another phase of the ingenuity of Mr. Webb as designer. The somewhat feeble exhaust from the L. P. cylinder, being called upon to work through the length of the front tubes, would be nominally insufficient to lift the deposit, and to release this accumulation of soot and ash the hopper became a necessity. Operated at will from the cab, it was otherwise airtight, and could no doubt be used with effect on lengthy journeys.

The neat outlines of the driving splashers were a fitting finish to the L. & N. W. R. locomotives, and though in after years plainer in design were always attractive. The "Greater Brit-

ain'' class were no exception in this respect., but often passed over is the fact that the leading wheel rod splasher was not required, as there was no rod to cover. Mr. Webb succeeded in preserving the symmetry of his design on this point so well that few recognize the absence of the usual coupling rod. It is possible that the provision was made so that a rod could have been coupled at some future date. But there seems no record of any such experiment. Indeed, coupling rods were not fitted to any Webb express engines working as compounds till the advent of the 1897 design of 4-4-0 4-cylinder machines.

When the ''Greater Britain'' class were first completed, the cab sheets tapered off from the front base and merged into the footplating. Eventually the familiar square splasher was restored, and it is possible that this was carried by the ''Queen Empress'' at Chicago. The official gold medal adorned such a fitting, anyway. Certainly the square form was much more in keeping with L. & N. W. traditional design.

The prominent position of the Roscoe lubricator, behind the funnel, was novel, for it was thus always kept warm, and protected from the blasts of wind when travelling. It must have been troublesome to fill, however.

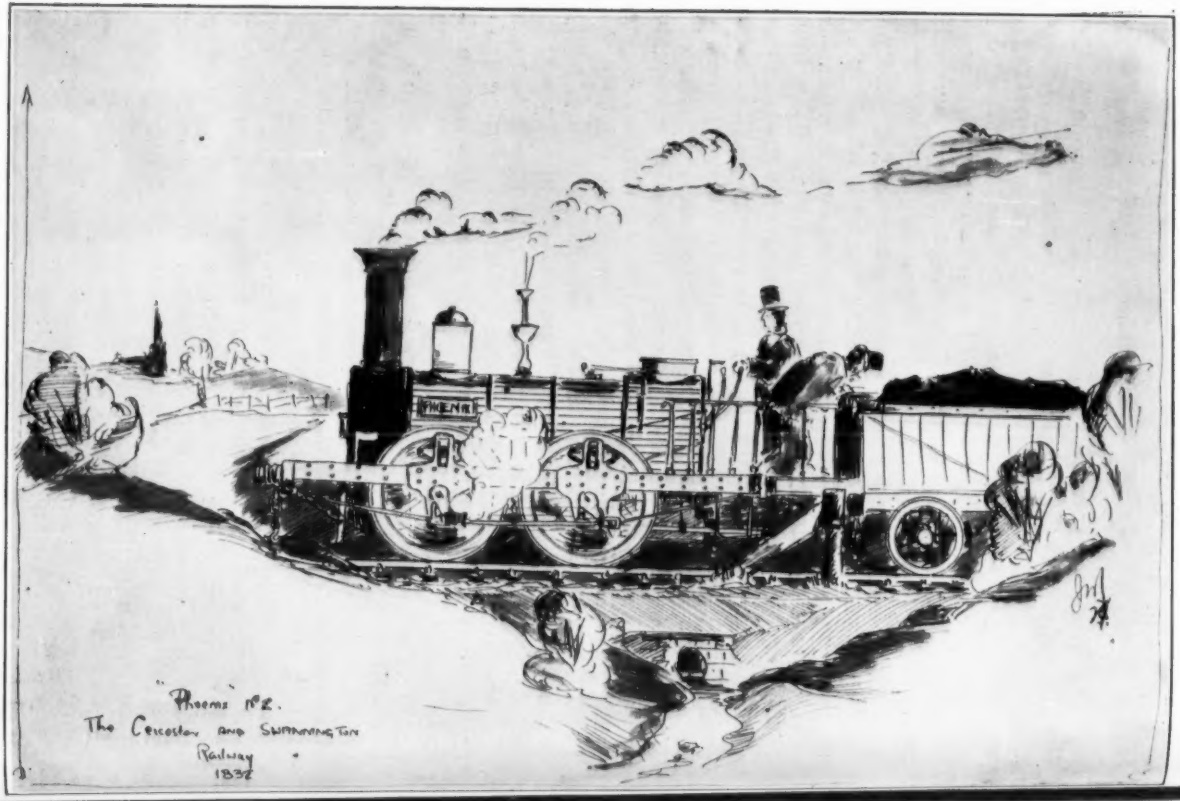
The Leicester and Swannington Railway.

By G. W. Bishop.

The brief announcement in the L. M. S. R. time tables for Sept. 24, 1928, that "The Leicester (West Bridge) and Desford service will be discontinued" marks the cessation of passenger transport upon a very historic piece of line. This line, 6½ miles long, is, in fact, a portion of the old Leicester and Swannington Railway, opened in 1832. There had recently been two passenger trains each way on week days, calling at the intermediate stations of Glenfield and Ratby, and taking 20 minutes for the journey. The departure of the last train at 5.20 p. m. on Saturday, Sept. 22, 1928, was celebrated by the explosion of fog signals, and many people boarded the train for the "last trip". Two of these passengers tossed a coin for the privilege of securing the last ticket, which will be preserved in Leicester Museum, along with the first one issued in 1832.

The old line was 16 miles long, with a tunnel at Glenfield 1796 yards long, an incline at Bagworth worked by cable, and another incline at Swannington worked by a stationary engine and rope. Glenfield tunnel has been termed "the oldest in the world", but it has been pointed out that this distinction really belongs to a tunnel on the Hay Tramway in Wales, opened in 1811. Glenfield Tunnel is so narrow that trains passing through had the windows barred to prevent passengers putting their heads out. On Sundays the tunnel was kept closed by white padlocked gates at each end.

George Stephenson was the first shareholder of the original line, Robert Stephenson being chief engineer. The first engine, the "Comet", a 0-4-0, had 60 inch coupled wheels, cyls. 12 X 16, and was built by Stephensons at Newcastle, being brought by sea to Hull, and from there by canal to the West Bridge Wharf at Leicester. This engine made a trial trip on May 5, 1832, and worked the first train from Leicester to Bagworth on July 14, 1832, the driver being George Stephenson himself, assisted by Robert Stephenson and a driver named Weatherburn. The "Comet" has been stated to have been "the first engine to run in the Midlands"; this may be true of a passenger railway, but the well-known "Agenoria", a similar engine to the "Stourbridge Lion", had commenced running on a colliery line near Dudley, three years previously, in 1829.



"Phoenix" 1st L.
The Leicester and Swannington
Railway
1832

The story has often been told of how the chimney of the "Comet" collided with the roof of Glenfield Tunnel on the opening trip, and broke off, covering the passengers with soot. It has also been frequently asserted that the line had the first steam whistle. Other accounts, however, maintain that Adrian Stevens, of Merthyr Tydvil, Wales, invented the whistle, as mentioned in Bulletin No. 15, page 70, whilst yet another account gives the inventor's name as William Stephens. The Leicester line certainly had a very early specimen, which was fitted to the "Samson", after that engine had run into a farmer's cart at a grade crossing near Thornton in 1833.

By 1839 ten engines had been built for the railway, six by Stephensons, one by Edward Bury, one by Tayleur & Co. (Vulcan Foundry), and two by the Haigh Foundry Co. Two had been sold for ballast work, namely, "Comet" to the London & Birmingham Ry., and "Phoenix" to the Birmingham & Gloucester Ry., in Dec., 1836. No. 6 "Atlas", was the first engine to be built of the popular inside cylinder 0-6-0 type.

Three types of sleepers or ties were used on the old line (1) longitudinal pattern in the tunnel (2) cross ties on embankments (3) diagonal stone blocks in cuttings. The Bagworth to Swannington section was opened in 1833. The crest of the railway, a wyvern, was taken from the standard of Mercia, and later adopted by the Midland Ry., which purchased the L. & S. Ry. in Aug. 1845.

The accompanying sketch, by Mr. J. W. Smith, shows engine No. 2 "Phoenix", built by Stephensons (makers' No. 6) in 1832, wheels 54 inches, cyls. 12 X 18. Sold for ballast work, as mentioned above.

Other Days.

By C. Warren Anderson.

At the time when A. Busby was Superintendent on the Northern Division of the Intercolonial Railway, there appeared in one of the provincial daily papers a news item of particular interest, concerning the speed attained by an extra train conveying a large party, among whom were gentlemen from Maine and Massachusetts, who stated that they had never traveled so fast before.

An average speed of 85 miles per hour was claimed from station to station on two sections of the line, although no special effort had been planned to achieve a record; indeed, a freight engine was employed between Campbellton and St. Flavie. The following are exact quotations;—

> "The distance from Charlo to Dalhousie Junction was made in seven minutes, being ten miles . . . from Rimouski to Bic eleven miles, in eight minutes."

One of the swiftest runs ever checked was from Athol to Amherst on the old "Stag" twelve miles in eleven minutes and fifteen seconds. The engine referred to was one of the old wood-burners built by the Portland Locomotive Works between 1850 and 1860. She was one of the first engines on the St. John and Shediac Line, and her dimensions are assumed to be;—Cylinders 15″ x 22″, driving wheels 66″, diameter of boiler 48″ and weight about 28 tons; wheel arrangement 4-4-0.

The Report of H. A. Whitney, Mechanical Superintendent, for the year 1870, gives information of, interest concerning the engines then in service. "Five engines are in good order, five are in fair condition and four require considerable repair." There were at that time in use the following: "Hercules", "Samson", "Kennebecasis", "Petitcodiac", "Scadouc", "Anagance", "Loostank", "Ossekeag", "Aboshaqui", "Prince of Wales", "Norton", "Prince Alfred", "Robert Jardine", "The Bear" and about six others. Most of these will be found mentioned in an article in Bulletin No. 8 by the writer entitled: "Some Railroad History of the Province of New Brunswick."

The engineers included men who were well-known a generation since; R. M. Stevens, A. Sinclair (for 33 years Foreman of the Mechanical Department at St. John, retiring October

, 1909 after more than fifty years service); J. A. ("Dusty") ore; John ("Scotty") Stewart; Thomas Prince and Robert James. Perhaps they would not be able to handle the huge modern locomotives as easily or as skilfully as their woodburners, but they are in many respects well worthy of the respect and emulation of the younger men now in the service.

Among the early railroaders there are two who were outstanding in their line of work and a short sketch of each will perhaps be of interest. A. B. Gray began his career as a sectionman on the Nova Scotia Railway in 1866, in time becoming foreman and then Roadmaster at New Glasgow, N. S. The track ith which he had to deal was ballasted with clay and rock taken

Old Intercolonial Locomotive # 124.
Built by Fleming—St. John.

from cuttings between Halifax and Bedford; the ties were nine feet long, of round timber, split in two halves with saws. The rails were of the 'H' pattern, with the top and bottom reversible, secured to the ties by cast-iron chairs, the ties being spotted to allow the chairs to sit level. Wooden keys or blocks of elm soaked in tar were used for fastening the rails in the chairs. When new, these rails made a smooth-running road; they were in 16 and 18 foot lengths brought out from England in 1855. The line between Halifax and Windsor Junction was relaid with iron "T" rails of the same pattern as those now in use, during 1867. The joints were secured by means of thin steel scabbards

which evinced a decided tendency to work loose and slip clear of the end of one rail, and the trackmen were kept busy maintaining them. The push-cars used in those days were much lighter than those employed at the present day; trackmen were paid ninety cents per day, and the Foreman, $1.25. The Trackmaster was the late William Marshall and his assistants were the late A. Feltham and William Youlds.

Michael Tobin was born in Halifax, February 1838, and commenced working for the Nova Scotia Railway in September 1856 at Richmond Machine Shop. Four years later he began firing for Driver Joseph McLellan, on the run between Halifax and Windsor. Mr. Tobin well remembered the visit of King Edward VII, (then Prince of Wales) in 1860, and how he traveled over the Railway. The engineer of the Royal Train was Wm. Stevens, and the conductor, John Murray, both being complimented by His Royal Highness for the efficient manner in which they performed their duties. Mr. Tobin received promotion to the right-hand side in that year. He also recollects the opening of the line from Truro to Pictou Landing, which event took place in 1867, having had the honor of driving one of the trains conveying many persons of note in Nova Scotia to the scene of the ceremony, among whom might be mentioned; Hon. Sir. Chas. Tupper, Sir Sanford Fleming (who built the Intercolonial) Collingwood, and Schreiber. Tobin was also engineer of the train which brought His Excellency the Marquis of Lorne, and Her Royal Highness, the Princess Louise, his wife, from Halifax to Truro on their coming to Canada, when the former assumed the Office of Governor-General. Tobin secured a high compliment from his illustrious passengers for the manner in which he handled the train, and also from the late C. J. Bridges, Minister of the Intercolonial Railway at the time. He continued to drive for over forty years and retired after fifty-one years of continuous service.

The first regular trains on the Nova Scotia Railway used to run with the passenger cars next the engine; they made good time and accidents were rare. It was quite a usual occurrence to see eight or ten flat cars on the regular morning train from Truro to Halifax, loaded with wagons of country produce. Special trains were often run out for loading and distributing ties, many having no vans, and only a conductor and one man, or sometimes a conductor only. The old-time conductors, now all passed away, include Murray, Loasley, Keys, McGrath and R.

Duncan. Early engineers were Wm. Hunt, W. Boyd, Edward Tobin, and J. McCarron.

Referring to early railways in Nova Scotia, the following taken from Zerah Colburn's "Engineering and Mechanism of Railways" is of interest;—

"Mixed traffic engine constructed by Messrs. Fox, Walker & Co., Bristol, for the Windsor and Annapolis Railway:—

Area of Grate	16.6 Sq. Ft.
Heating Surface	947.5 Sq. Ft.
Diameter of Cylinders	16.0 In.
Stroke of Pistons	22.0 In.
Diameter of Driving-wheels	5.0 Ft. 1 In.
Length of Wheel-base	20.0 Ft. 3 In.
Length of Wheel-base to centre of Bogie	17.0 Ft. 9 In.
Length of Wheel-base of Bogie	5.0 Ft. 0 In.

This engine is, in general design, in accordance with the prevailing American type of Passenger engines—having four coupled wheels and a bogie. The resemblance ends there, for the engine is entirely English in detail, which appears to be very much appreciated by the officials of the lines on which the engine is at work. The bogie is strongly constructed with plate-framing and inside bearings; and besides having the ordinary rotating movement on a pivot, it may traverse laterally for a few inches. A slight lateral movement has also been provided for in the axle-boxes of the driving wheels. There are 150 flue-tubes, two inches in diameter; and as the barrel of the boiler is 4 Ft. 2 in. diameter, there is abundant space for the generation of steam and circulation of water. The tender holds 2000 gallons of water (Imperial) and is carried on two four-wheeled bogies.

This engine had the cylinders on an incline and with the main valves and steam chests on their sides between the frames. On the cab was a name plate with the following; "Fox Walker & Co., Engineers, Bristol, 1868." The name "Evangeline" was on the splasher over the leading driver.

The Windsor and Annapolis Railway later became the Dominion Atlantic, now controlled by the Canadian Pacific Railway.

Letters from Mr. Haggerty

Southbridge, Mass., March 15th, 1917.

My Dear Mr. Fisher:

Your letter of March 13th has been received and read with much pleasure.

With regards to Sir Samuel Morton Peto, he was at one time President of the Atlantic & Great Western Ry. The road was owned and built by English capital as was the Erie. Sir Samuel Morton Peto was the projector and builder of the Grand Trunk, Quebec via Montreal to Toronto and put in much of his private fortune. Frank Cummings was their first Master Mechanic, went there when very young from the Portland Works and remained many years.

Your accounts at the Mason works were of interest. I commenced with Abel Tinkham making saddle bars and then got with "Ben" Lawton and Charles Redfern.

After the Erie passed from Gould and Fisk, the beautiful decorations began to pass. James McHenry, Trustee for the English bondholders, himself from England, brought a new era. The Atlantic & Great Western was their outlet at Salamanca, the road running to Cincinnati, 448 miles and then on to East St. Louis 346 miles via the Ohio & Mississippi R. R. making a 6 foot gauge road from New York to St. Louis, 1207 miles. The O & M had their quota of beauties built mostly by Moore & Richardson, Cincinnati. Among them were the "Gen'l Geo. B. McClellan", "Col. S. R. Johnston", "E. G. Bondurant", "E. W. Cole", etc. Do you remember the beautiful Providence & Stonington engines "S. F. Dennison" and "W. B. Burnham", both built at Manchester?

Here is a list of Boston, Hartford & Erie R. R. engines that ran into Southbridge:

No. 2 "Resolute", Taunton
5 "Talbot", Schenectady
7 "Fishkill", Schenectady
9 "Economy", Hinkley. This was the 2nd No. 9.
10 "Onward", Schenectady.
12 ? Taunton
13 "Alert", Taunton
14 "Surprise", Hinkley
17 ? Taunton
18 "Pioneer", McKay & Aldus
19 "Pilgrim", McKay & Aldus
20 "Advance", McKay & Aldus
21 "Moose", Taunton
22 "Enterprise", Taunton

25 "Costello", Hinkley
24 "Fawn", Hinkley
28 "Kimball", Hinkley
29 "Plumber", Hinkley
31 "Trustee", Hinkley
32 "Pascoag", Schenectady
26 ? Schenectady
27 ? Schenectady

These names and numbers were given me by a man who 45 years ago commenced work checking freight here. I had forgotten some. No. 17 was the first new one I ever saw. She never had a name and was so handsome.

I was surprised to hear that Fred Shalling was over 90 as I could account for 87. He told me in 1884 he was 54 but maybe he said 57. Either is a grand old age.

I think "Bill" Evans was the only eye witness of that blow up. When "Bill" finished his account, I asked him what became of the engineer. He said, "He jes' stood thor with his oil can in his hand wondering whar she had gone".

The "Uncle Tom" resembes the "Pup" more closely than the one on the time card of 1854. The woodcut shows an English engine in part, but her tender while English is just like the Boston & Worcester tenders of long ago. I remember the old "Buffalo" which laid the track here, an old B & W engine, also the "Jupiter", "Fury", "Hecla" and "Brookline", all inside, four drivers and four wheel tenders. The "Pup" had her one pair of drivers forward of the firebox, outside connected and a bogie front truck, little cab, had a bell and whistle and in 1866 burned coal. She had a four wheel tender. That 1854 timebill must have been the last or about the last the Boston & New York Central issued for in 1866 it had grown up to brush and trees and it takes time to grow wood. In 1866 the iron from Thompson to Mechanicsville was ripped up and laid Thompson to Southbridge.

Hoping to hear from you again soon, I am,

Very truly yours,

GEO. A. HAGGERTY.

Southbridge, Mass., April 27, 1917.

Dear Mr. Fisher:

Yours of the 20th came safely. Ben Lawton ran a string of planers and planed the links, etc. on the ground floor—"Long Shop".

The "Tomlinson" that blew up about 1872 (P. & S.) was a large modern engine, outside, Jersey City Locomotive Works.

Yes, the Rutland road had some good engines. Nickolas L. Davis, formerly a locomotive engineer out of Taunton, was for many years Master Mechanic at Rutland. Charley Farmer and Dick McCarty "owned" the "Moosalamoo" and "Ethan Allen" respectively. Have rode with them both ways between Rutland and Bellows Falls when everything there burned "Slivers and Hay". McCarty was a Frenchman regardless of name. It was then under lease, 1873-78, to the Central Vermont.

B. H. & E. No. 17, with no name, was 16x24" Taunton, a brand new one. The first new one I ever saw and the first Taunton. She came to this town running a gravel train early in 1866 and before the road was opened. She was a beauty to my notion as well as to the "gang" of boys that I belonged to.

No doubt the "Braintree", "Stowe", "Fairfax" and "Richmond" went to the Ogdensburg & Lake Champlain for then the road was operated by the Vermont Central. Mason lettered them Vermont Central & Vermont & Canada. Abraham Klose became Sup't. and M. M. Rouses Point to Ogdensburg. The Vermont Central up to 1872 was the largest line in New England. After they went into receivership they let Henry Perkins, M. M. at St. Albans go. He built many engines, many insiders there. When he came to the road he removed all the sand boxes. Said there was no need for them. When the Southern Pacific was opened 1867 he left and went to that road but did not stay. Then he went to Taunton and kept a shoe store on the "Green".

Yours very truly,

GEO. A. HAGGERTY.

Southbridge, Mass., March 27, 1917.

Dear Mr. Stuart:

I have been so entertained in reading your letters to Mr. Fisher that I must personally thank you for them. I wish to ask, if it is not too much trouble, could you send me the clipping concerning the "Uncas" derailment in 1850. The 1854 Time bill has come through the kindness of Mr. Fisher and it interests me exceedingly. Yesterday I sent him another "Epistle to the Corinthians" and a bunch of old photos and newspaper clippings. Mail bags were full going out. Will return that clipping as soon as I read it.

Thanking you,

I am truly yours,

GEO. A. HAGGERTY.

Southbridge, Mass., May 29th, 1917.

My dear Mr. Stuart:

Your ever interesting letter of the 16th came safely and I very much appreciate it, together with the copy of Mr. Fletcher's letter, which to me is like "foot prints on the sands of time".

I have seen Amoskeags and many Manchesters. I knew Aretus Blood, Agent at the Manchester Works and knew Mr. A. O. Bailey very well by reputation. After leaving the Manchester Works he came to the Boston, Hartford & Erie R. R. as Master Mechanic, in 1863 or 1864 and then went to the European & North American R. R. in Maine—Bangor to Vanceboro. He died at the home of his daughter at Mattawaumkeag, Maine in 1889 or 1890. He was a very capable man.

The line which Mr. Fletcher mentions as the Boston & New York Central, Boston to Woonsocket, built as he says just before the War, was really called when built the Boston & New York Air Line and came out of Boston a ways over the Boston & Albany. The B.H.& E. took it over and it then became the Woonsocket Division. I remember the two hard coalers, "Marshall S. Rice" and "Hiram Allan". They became B. H. & E. Nos. 8 and 9, were built by R. Norris & Sons, Philadelphia, Shop Nos. 1012 and 1013, all marked or rather engraved on the sides of their brass steam chest casings. They were changed to soft coal by Mr. Bailey. The No. 9 ran to Southbridge a long while and was running in 1878.

I have not the least doubt that the "John Ruff" was the same as the "Pup". The locomotive "Amherst" mentioned and lettered A. B. & P. R. R. which he saw on the Concord R. R. during the War stood for Amherst, Belchertown & Palmer R. R. This road formed a part of the New London Northern when it was combined with the New London, Williamantic & Palmer—now Central Vermont R. R. The "Hookset" was sold by the Concord R. R. to the Boston & New York Central or to the Midland and I am sure that the "Pup" came along with her.

Shall be glad to hear from you at any time.

Truly yours,

GEO. A. HAGGERTY.

(The above letter is one of the last letters written by Mr. Haggerty.)

Errors of Railroad Management.

Among some papers recently received at the Baker Library, Harvard Business School, was the note book and engineers record of the late Isaac Collins Chesborough, of Copake, N. Y. Mr. Chesborough served during the original survey of the Baltimore & Ohio R. R., and was later employed by the Boston & Providence, Western Vermont and Northern Pacific Roads. From the collection of Mrs. Henry A. Francis, the following was found in Mr. Chesborough's note book, dated 1859, which if they apply then, they certainly do in 1929.

"Local interest and prejudice too predominant in selecting points.

"Incompetent Engineers and Ignorant Managers.

"Inadequate means provided before commencement.

"Consequent resort to ruinous loans and payments in stocks, bonds or notes.

"Imperfect construction following.

"Haste to commence operations for traffic.

"Consequent inability to perfect the roadbed.

"Unfaithful and unskilful Agents and Receivers.

"Overestimate of value of thro' to neglect of local business.

"Attempts to exhibit large receipts to neglect of profits.

"Allowing too many agents to contract for business under temptation.

"Doing one kind of business under cost to draw some other, forgetting that rival companies will be looking after the other business.

"Entangling alliances and erroneous estimates (or non-estimates) of mutual advantages.

"Inadequate facilities for receiving, protecting and forwarding freight—both extremes.

"Foolish rates of speed.

"Carrying dead weight, including running too many trains.

"Use of bad materials.

"Unwise competition, out of which results some of the foregoing.

"General want of System.

"Note: As some roads have been 'carried through' under all of these defects, is it any wonder they have been sunk beyond hope of recovery."

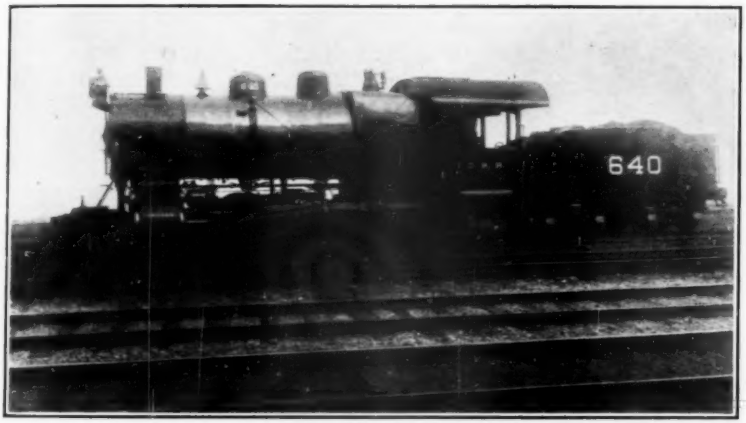
These statements, true in 1859, are certainly to be avoided in 1929.

An Interesting Locomotive of Thirty Years Ago.

Thirty years ago, or to be exact, September, 1899, there was built at the Brooks Locomotive Works, locomotive No. 640 for the Illinois Central R. R. At that time, this locomotive was the largest engine in the world and in view of modern developments a brief statement with regards to its design may be of interest.

As shown in the illustration, the locomotive was of the 4-8-0 type, the tender capacity of 7000 gallons of water and 15 tons of coal.

The cylinders were 23x30″ with piston valves, drivers 57″ diameter, weight on drivers 181400 lbs., total weight of engine 221450 lbs., total weight of engine and tender 369050 lbs.



Illinois Central R. R. #640.

Courtesy of I. C. R. R.

The boiler was of the Player-Belpaire type with plates 15/16″ and 1″ thick. The diameter at the front end was 80⅛″, at connection 88″ and at throat 91¼″. The pressure was 210 lbs. per square inch, grates are 37.5 sq. ft. and heating surface, total, of 3500 sq. ft.

The tractive force of this engine was something like 50000 lbs., though in practice the engine could exert a bigger pull than that. At any rate, this engine was designed to haul a train weighing 2045 tons up a grade of 38 feet per mile, combined with

3° curves, at a speed of 15 miles per hour. On the level, the engine could haul a very handsome load.

Modern locomotives with their boiler capacity which enables locomotives to haul heavy trains at high rates of speed could easily outstrip this locomotive of thirty years ago, but the No. 640 is an interesting development of a powerful locomotive and of a type not generally used on our roads.

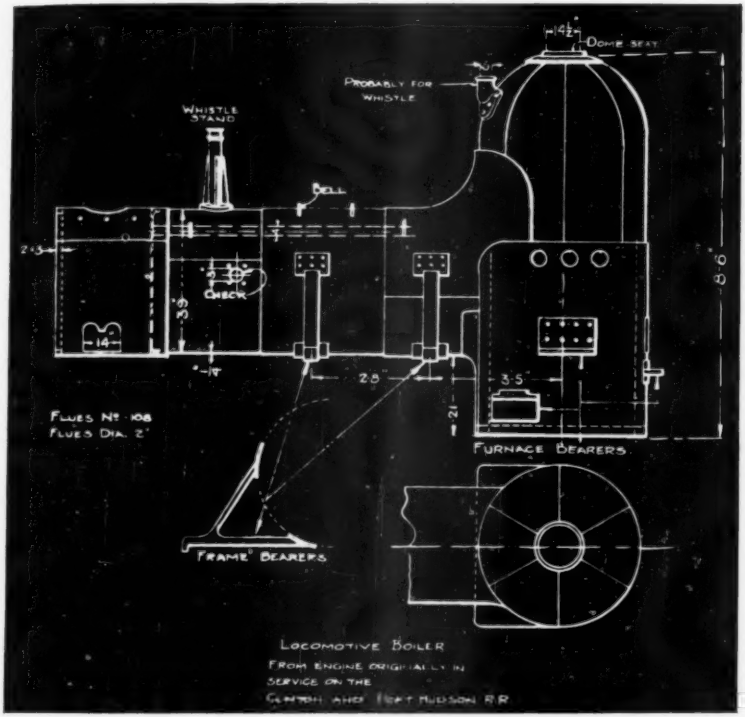
Old Bury Engine.

Through the kindness of Mr. W. O. Moody, we received some time ago the information together with the illustrations which accompany this sketch.

The Old "Bury" Boiler Recently Located.

It seems that some of the men of the Illinois Central R. R., assigned to field work in the Valuation Department, discovered on a branch line of their Vicksburg Division, an old "Hay-

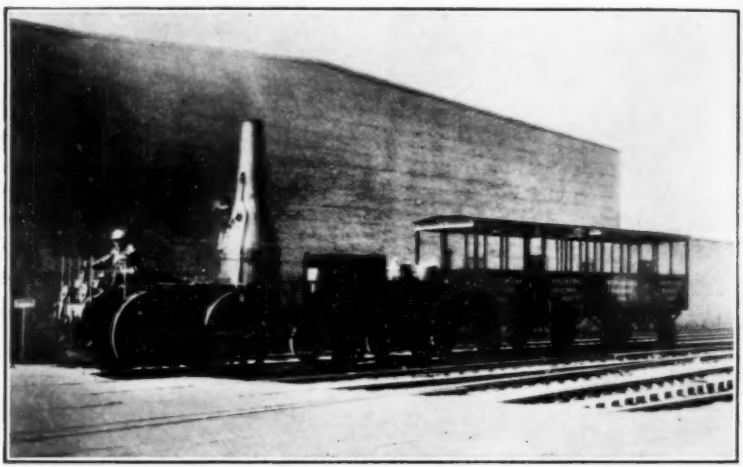
stack" or "Bury" type of boiler. A photograph was made and the accompanying sketch was made up under the direction of Mr. Moody for our members. The engine was originally in ser-



vice on the Clinton & Port Hudson R. R., but the name and date of construction have been lost. The sketch illustrates very clearly the Bury type of boiler and will be of no little interest to our readers.

History of the "Best Friend of Charleston".

Recalling the days of nearly a century ago when the enterprising business men of Charleston, S. C., were among the earliest and most active and effective advocates of the construction of railroads, the Southern Railway System has built a reproduction of the "Best Friend of Charleston," first locomotive built in the United States to be operated in actual transportation service, and of the tiny train which was pulled by this pioneer locomotive on its maiden trip.



"Best Friend of Charleston".

Reproduction by Southern Railway in 1928 of the first locomotive built in America for actual service on a railroad. The original was constructed at West Point Foundry in New York City and was placed in regular service on line of South Carolina Canal and Rail Road Company (now Southern Railway) at Charleston, December 25, 1830.

Photograph Charleston November 6, 1928. Engineer H. L. Cogburn.

Courtesy of Southern Ry.

Built in the Charleston shops of the Southern, the "Best Friend" of 1928 follows the lines of the original which was built at the West Point Foundry in New York for the South Carolina Canal and Rail Road Company and brought to Charleston by ship on October 23, 1830. After several trial trips, the engine was put in regular service on December 25, 1830.

Like its prototype, the "Best Friend" weighs only approximately four tons and has an upright boiler, resembling a bottle. It has four driving wheels, fifty-six inches in diameter. Two inclined cylinders with six-inch bore and sixteen-inch stroke work

down on a double crank inside the frame with driving rods connecting with the axle carrying the rear pair of driving wheels. The wheels themselves are outside the frame with connecting rods working outside their hubs. The cylinders are at the forward end of the engine and the boiler at the rear end.

The train consists of a service car, forerunner of the modern engine tender, and two coaches which look like omnibuses on flanged wheels. The service car and coaches were built in the Southern's shop at Hayne, S. C., and are also faithful reproductions of the train which was drawn by the original "Best Friend" on its first run.

The career of the original "Best Friend" was brief as well as historic. On June 17, 1831, its boiler was destroyed by an explosion, a negro helper having tied down the safety valve in the absence of the engineer as he was annoyed by the sound of escaping steam. Three men were injured in the accident. Subsequently the running parts of the "Best Friend" were used in the construction of the "Phoenix," which remained in service for many years.

The "Best Friend" was designed by C. E. Detmold. Horatio Allen was chief engineer and one of the earliest advocates of steam power for locomotion. Nicholas W. Darrell, whom South Carolinians acclaim as the first American railroad engineer, helped set up the "Best Friend" after its arrival in Charleston and was the first man to open the throttle. He ran an engine for many years and was then promoted to master machinist, in which position he served until his death in 1869.

The South Carolina Canal and Railroad Company was chartered December 19, 1827. Construction work began in Charleston on January 9, 1830, six miles of track, built on trestle work and laid with strap rail, were completed that year. The road was opened to Branchville, S. C., 62 miles, in November, 1832, and to Hamburg, S. C., on the Savannah River, opposite Augusta, Ga., October 1, 1833. It was then 136 miles in length and the longest continuous railroad in the world; also the first railway to carry the United States mail. The original line and the branches are now included in the Southern Railway System.

The reproduction of this pioneer locomotive and its train serves to call attention to the extraordinary part which Charleston played in the development of early railroads in the South. The construction of the line to Hamburg fired other communities with the ambition to build railroads, many of which were constructed largely with the help of capital furnished by Charleston.

Unparalleled Speed.

It is a well-known fact that on several occasions railway trains, both in Europe and America, have succeeded in attaining a high rate of speed for a short distance: but heretofore it has been found impossible to maintain such speed for any considerable distance.

With a view of testing the ability of the new standard passenger engines of the New York Central & Hudson River Railroad, to make long runs at high speed, Third-Vice-President Webb and a party comprising General Superintendent Theodore Voorhees, Superintendent of Motive Power and Rolling Stock William Buchanan, Assistant Superintendent of Motive Power

The Engine 870 and Special Train.

John Campbell, General Passenger Agent George H. Daniels, Angus Sinclair, Editor of the "National Car and Locomotive Builder", and Secretary of the Master Mechanics' Association of the United States, R. N. Burnett, Railroad Editor of the New York "Sun", and Arthur Leonard, Private Secretary to the Vice President, left Grand Central Station, New York, on the morning of September 14, 1891, on a train consisting of engine No. 870, weight 200,000 lbs., New York Central Private Car No. 247, weight 88,500 lbs., Wagner Palace Car Company's private cars "Traveler", weight 77,900 lbs. and "Mariquita", weight 93,600 lbs. Total weight of train 230 tons or 460,000 lbs. About equal in weight to an ordinary train of five cars. The run

from New York to Albany, 143 miles, which was made without a stop, occupied 140 minutes; the distance from Albany to Syracuse, 148 miles, was covered in 146 minutes; and that from Syracuse to East Buffalo, 146 miles in 147 minutes and 34 seconds.

The change of engines at Albany required 3 minutes and 28 seconds, the change at Syracuse 2 minutes and 58 seconds, and a hot journal at Fairport occasioned a delay of 7 minutes and 50 seconds. The gross time of the trip from New York to East Buffalo—436½ miles—was 439½ minutes, including all stops, while the actual running time, exclusive of stops, was 425 minutes and 44 seconds for the 436½ miles.

Changes of engines were made at Albany and Syracuse in the same manner as is done with all through passenger trains on the New York Central. Engine No. 870, Engineer Wm. Kirk, Fireman Benjamin Baptist, taking the train from New York to Albany; No. 876, Engineer E. L. Chase, Fireman J. Stark, making the run from Albany to Syracuse; and engine No. 862, with Engineer Chas. Hogan, Fireman C. Distel, concluded the day's run from Syracuse to East Buffalo.

The party was accompanied over the Hudson Division, New York to Albany, by Superintendent D. B. McCoy, over the Mohawk Division, Albany to Syracuse, by Superintendent F. A. Harrington, and over the Western Division, Syracuse to East Buffalo, by Assistant Superintendent Henry Gould. The conductor in charge of the train from New York to East Buffalo was H. N. Rockewell.

Following is a complete schedule of the run, compiled from the official time record, kept by Mr. Angus Sinclair and Mr. Arthur Leonard.

Stations	Distance from New York	Leaving Time H M S A.M.	Distance between Stations	Time between Stations M S	Miles per Hr. between Stations
New York (G C T)	—	7 30 15	—		
125th Street	4.38	7 36 58	4.38	6 43	39.12
138th Street	4.95	7 38 00	4.57	1 02	33.00
Mott Haven Jct.	5.30		5.30		
High Bridge	7.10		1.80		
Morris Heights	8.03	7 41 50	.93	3 50	48.20
Kings Bridge	9.86	7 43 40	1.83	1 50	59.89
Spuyten Duyvil	11.15	7 45 20	1.29	1 40	46.44
Riverdale	12.89	7 47 52	1.74	2 32	41.21
Mount St. Vincent	13.60		.71		
Ludlow	14.41	7 49 29	.81	1 37	56.31
Yonkers	15.22	7 50 15	.81	46	
Glenwood	16.06	7 51 10	.84	55	55.00
Hastings	19.44	7 54 15	3.38	3 05	65.77

Dobbs Ferry	20.71	7 55 22	1.27	1 07	68.24
Irvington	22.71	7 57 10	2.00	1 48	66.66
Tarrytown	25.88	7 59 25	2.57	2 15	68.53
Scarborough	29.44	8 03 20	4.16	3 55	63.72
Sing Sing	30.90	8 04 39	1.46	1 19	66.33
Croton Landing	34.42	8 08 00	3.52	3 21	66.00
Oscawana	36.41	8 09 50	1.90	1 50	65.12
Crugers	37.29	8 10 50	.88	1 00	52.50
Montrose	38.84	8 12 20	1.55	1 30	62.00
Peekskill	41.29	8 15 16	2.45	2 56	50.11
Highlands	46.10	8 20 17	4.81	5 01	52.52
Garrison	49.86	8 23 48	3.76	3 31	64.15
Cold Spring	52.56	8 26 15	2.70	2 27	66.12
Storm King	54.61	8 28 00	2.05	1 45	70.28
Duchess Junction	57.26	8 30 24	2.65	2 24	66.25
Fishkill	58.98	8 31 50	1.72	1 26	72.00
Low Point	62.52	8 34 55	3.54	3 05	69.00
New Hamburg	65.11	8 37 09	2.59	2 14	69.58
Camelot	69.60	8 41 05	4.49	3 56	68.05
Poughkeepsie	73.48	8 44 45	3.88	3 40	63.49
Hyde Park	79.25	8 50 32	5.77	5 47	59.86
Staatsburg	83.70	8 55 15	4.45	4 43	56.61
Rhinecliff	89.08	8 59 55	5.38	4 40	69.14
Barrytown	94.69	9 04 40	5.60	4 45	70.86
Tivoli	99.01	9 08 18	4.32	3 38	71.00
Germantown	104.56	9 13 00	5.55	4 32	70.85
Linlithgo	108.30	9 16 20	3.74	3 20	62.32
Catskill Station	110.17	9 18 35	1.87	2 15	50.00
Hudson	114.45	9 22 48	4.28	4 13	60.90
Stockport	118.70	9 27 12	4.25	4 24	58.00
Coxsackie	121.89	9 30 00	3.19	2 48	68.36
Stuyvesant	124.27	9 32 06	2.38	2 06	68.00
Schodack	130.37	9 37 40	6.10	5 34	65.75
Castleton	134.29	9 41 26	3.92	3 46	59.25
East Albany	141.39		8.10		
Albany	142.18	9 49 58	.49	8 32	60.40
Between New York and Albany, allowing 1 minute 43 seconds					62.11
Changing Engines, 3 minutes, 28 seconds					
Albany	—	9 53 26 A. M.			
West Albany	146.00	9 59 21	3.12	5 51	32.00
Karners	151.10	10 05 38	5.10	6 17	48.07
Athens Junction	156.54	10 11 16	5.45	5 38	57.94
Schenectady	159.88	10 14 40	3.34	3 24	58.94
Hoffmans	169.14	10 24 32	9.26	9 52	56.30
Cranes Village	172.48	10 27 35	3.34	3 03	65.70
Amsterdam	175.72	10 30 37	3.24	3 02	64.09
Akin	178.77	10 33 26	3.05	3 49	65.00
Tribe's Hill	181.37	10 35 51	2.60	2 25	64.55
Fonda	186.33	10 40 27	4.96	4 36	64.07
Yosts	191.57	10 45 10	5.24	4 43	66.66
Sprakers	194.87	10 48 05	3.30	2 55	67.88
Palatine Bridge	197.79	10 50 49	2.92	2 44	64.10
Fort Plain	200.94	10 54 38	3.15	3 49	49.50
St. Johnsville	206.59	11 00 03	5.65	5 25	62.58
East Creek	209.87	11 03 04	3.28	3 01	65.23
Little Falls	216.43	11 09 06	6.55	6 01	65.13
Herkimer	223.53	11 15 58	7.11	6 52	62.10
Illion	226.01	11 18 15	2.48	2 15	66.13
Frankfort	228.13	11 20 06	2.12	1 53	67.54
Utica	237.55	11 28 56	9.42	8 50	64.00
Whitesboro	241.44	11 33 09	3.89	4 13	55.31
Oriskany	244.46	11 36 02	3.02	2 53	62.84

Rome	251.99	11 43 42	7.53	7 40	58.93
Greens Corners	256.20	11 47 58	4.21	4 16	59.20
Verona	260.31	11 51 52	4.11	3 54	63.23
Oneida	264.67	11 55 45	4.36	3 53	67.32
Wampsville	267.57	11 58 23	2.90	2 38	66.01
Canastota	269.90	12 00 25 M.	2.33	2 02	68.75
Canaseraga	273.71	12 03 44 P.M.	3.81	3 19	68.92
Chittenango	276.04	12 05 45	2.33	2 01	69.31
Kirkville	280.12	12 09 19	4.08	3 34	68.63
Manlius	282.63	12 11 33	2.51	2 14	57.43
De Witt	286.04	12 14 34	3.41	3 01	67.82
Syracuse	290.72	12 19 45	4.68	5 11	54.10
Changing Engines, 2 minutes, 30 seconds.					
Syracuse	—	12 22 17			
Belle Isle	296.35	12 29 51	5.63	7 10	47.14
Warners	299.98	12 33 01	3.63	3 23	64.32
Memphis	302.54	12 35 32	2.56	2 18	66.71
Jordon	307.69	12 40 10	5.15	4 38	66.07
Weedsport	312.04	12 44 01	4.35	3 51	67.79
Port Byron	315.43	12 47 06	3.39	3 05	66.00
Savannah	322.48	12 53 27	7.05	6 21	66.61
Clyde	328.54	12 58 59	6.06	5 32	65.71
Lyons	335.61	1 05 40	7.07	6 41	66.08
Newark	341.10	1 10 59	5.49	5 19	61.94
Palmyra	348.54	1 17 56	7.44	6 57	64.23
Walworth	351.90	1 21 09	3.36	3 13	62.67
Macedon	353.63		1.73		
Fairport	361.15	1 36 30	7.52	9 21	59.35
Pennfield	363.79	1 42 26	2.64	11 52	39.22
Brighton	367.76	1 46 19	3.97	3 53	61.34
East Rochester	368.98	1 47 33	1.22	1 14	59.35
Rochester	371.10	1 49 49	2.12	2 15	56.11
Center Park	371.56		.46		
Cold Water	377.96	1 56 35	6.40	6 46	60.83
Chili	381.68	1 59 58	3.72	3 23	65.97
Chili Jct.	382.85	2 01 01	1.17	1 03	68.86
Churchville	385.92	2 03 50	3.07	2 49	65.40
Bergen	389.04	2 06 47	3.12	2 57	63.46
West Bergen	392.39	2 10 09	3.35	3 22	59.07
Byron	395.89	2 13 33	3.50	3 24	61.27
Batavia	403.44	2 21 26	7.55	7 57	57.46
West Batavia	409.44	2 27 13	6.00	5 47	62.22
Corfu	414.61	2 31 33	5.37	4 20	74.35
Crittenden	419.17	2 35 23	4.36	3 50	68.24
Wende	422.16	2 38 10	2.09	2 47	64.45
Looneyville	423.96	2 39 40	1.80	1 30	72.00
Grimesville	428.85	2 44 00	4.89	4 20	67.70
Forks	433.07	2 47 24	4.22	3 24	74.47
East Buffalo	436.32	2 50 00	3.25	2 36	75.00

New York to Albany

Left New York (Grand Central Station) 7 30 15 A. M.
Arrived at Albany 9 49 58 A. M.
143 miles in 139 minutes and 43 seconds.
Stopped at Albany, changing engines, three minutes and twenty-eight seconds

Albany to Syracuse

Left Albany 9 53 30 A. M.
Arrived at Syracuse 12 19 45 Noon.
148 miles in 146 minutes and 15 seconds.
Stopped at Syracuse, changing engines, two minutes and fifty-eight seconds.

Syracuse to Fairport

Left Syracuse 12 22 41 P. M.
Arrived at Fairport 1 30 30 P. M.
70⅛ miles in 67 minutes and 49 seconds.
Detained at Fairport, cooling hot journal, seven minutes and fifty seconds.

Fairport to East Buffalo

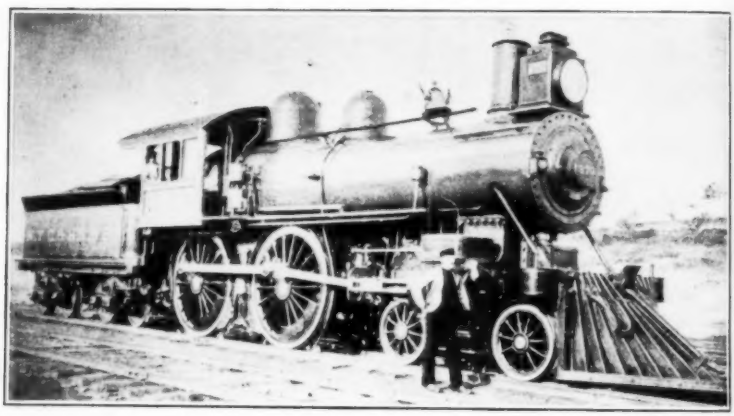
Left Fairport 1 38 20 P. M.
Arrived at East Buffalo 2 50 15 P. M.
75.17 miles in 71 minutes and 55 seconds.

Total Run

436½ miles in 439½ minutes—including three stops.

Actual Running Time

436½ miles in 425 minutes and 44 seconds.



N. Y. C. & H. R. R. R. # 870.

Engine No. 870, as illustrated, is the one that hauled the record-breaking special train from New York to Albany, Sept. 14, 1891, and is a type of the new passenger engines of the New York Central & Hudson River R. R. It was designed by Mr. William Buchanan, Superintendent of Motive Power and Rolling Stock, and constructed at the Schenectady Locomotive Works, Schenectady, N. Y. The recent test was demonstrated that as a class these are the fastest and most powerful engines ever built. Their ability to create a sustained speed of over 60 miles an hour with a standard weight passenger train for such

a long distance being regarded by mechanical experts as a triumphant solution of many of the problems encountered in motor construction.

Following is a technical description:

Engine 870 is an eight-wheeled passenger locomotive; the main dimensions are as follows: The drivers are four in number, 6 ft. 6 in. diam., 8 ft. 6 in. spread. The cylinders are 19 in. diam. by 24 in. stroke. The engine truck wheels are 36 in. diam. and 6 ft. 8 in. spread. The weight on the four drivers is 80,000 lbs and on engine truck 40,000 lbs. The boiler is of the wagon top type, 58 in. diam. at the smallest ring, and has 268 flues, 2 in. outside diam, 12 ft. long. The firebox is set on top of the frames, and is 96 in. long by 40⅞ in. wide. A brick arch is used, supported on arch pipes. The total heating surface is 1851.50 sq. ft. The total grate surface is 27.3 square feet. The smokebox is extended, and fitted with a deflector plate and netting. The stack is straight, 16 in. diam. inside. The exhaust nozzles are double. The boiler is designed to carry 180 pounds steam pressure.

The tender has a coal capacity of 6¾ tons and carries 3,500 gallons of water. It is carried on two four-wheel trucks, each 4 ft. 5 in. wheel base, with 36 in. wheels. The weight loaded is 80,000 lbs. Making the total weight of engine and tender 100 tons. The engine and tender are fitted with the Westinghouse Air Brake. The tractive force of the engine is 15,720 lbs. and the ratio of weight on drivers to tractive force is .196.

(The above information and photographs from a leaflet issued by the New York Central & Hudson River R. R. describing this test run.)

Replica of the Colonel Stevens Locomotive.

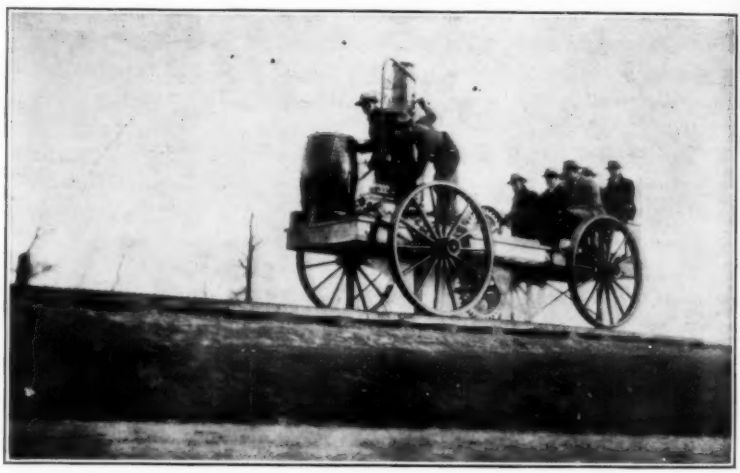
At the inaguration of Dr. Harvey Nathaniel Davis, as President of the Stevens Institute of Technology, November 22nd and 23rd, 1928, a replica of Col. Stevens locomotive was run on a circular track for the benefit of the guests.

The following account of the locomotive is from "The Stute" of November 22nd, and will be of interest.

REPLICA OF STEVENS LOCOMOTIVE OPERATED

Pennsylvania Engineers Make Final Tests for Inaugural Demonstration Friday.

The replica of the John Stevens locomotive of 1826 which is to be in operation for the Inauguration of President Davis on



Replica of Col. Stevens Locomotive.

Friday, arrived in Hoboken last Saturday and was placed on the rails immediately to await testing this week. The locomotive has been under construction at the Altoona shops of the Pennsylvania Railroad for several weeks, and last Wednesday workmen began the grading of part of the upper field for the special track upon which the "Steam Carriage" is to run. This track has been made as nearly as possible like the original, from details in the records of the Stevens family. It is in the form of a circle a little over 200 feet in diameter. The rails are of wood, with

iron straps fastened on top, short straight sections being used instead of curves. Centered between these two rails is a third, also of wood, on top of which are sections of a cast-iron rack to gear with a cog wheel on the locomotive.

The "Steam Carriage."

The locomotive itself is fitted with ordinary wagon wheels about five feet high, entirely independent of the power plant. Near one end is the boiler, encased in a cylindrical iron shell surmounted by a flat cone which terminates in a cylindrical stack. This part of the locomotive is very similar in appearance to the boiler casing of an ordinary hoisting engine. The boiler is the multitube type that Col. Stevens patented in 1803. It consists of twenty vertical tubes, about 1 3-16 inches in diameter, set in circular headers. The tubes are arranged in a circle and an opening in the header permits cordwood, inserted through a door in the conical shell, to be dropped down inside the circle of tubes. Coal had not yet come into use in this country at the time the locomotive was built, except in parts of Pennsylvania where it could be easily brought down from the mines.

A pipe from the top of the boiler conducts the steam to the single horizontal cylinder, which is 5 inches in diameter with a 12 inch stroke. An ordinary barrel holds the water-supply, which is forced into the boiler by means of a hand pump. A common lever safety valve prevents the boiler pressure from becoming too great. The boiler and safety valve of the original locomotive will be on exhibition during the Inauguration.

No Flanged Wheels.

To obviate the difficulty of high friction losses in flanged wheels on the sharp curve, Col. Stevens equipped the locomotive with rollers which bear upon the inside of the rails, one opposite each wheel. Thus it was possible to use wagon wheels on a curved track.

On the opposite end from the boiler are two benches, upon which, on the original, the honored passengers sat while being treated to a ride on Col. John Stevens' experimental railroad in 1826. No cars were drawn by this locomotive, as far as is known. The speed of the original was about six miles an hour. Owing to tighter joints and better packing in the replica, greater speeds have been obtained, with steam pressures as high as 100 lbs. per square inch, a figure unknown in Col. Stevens' day either here or in Europe.

Locomotive Rosters.

The following list of two hundred locomotive rosters is taken from the Annual Reports of the roads listed and is owned by the Society. Any of our members who wish typed copies of these rosters can procure same upon application to the Editor. There is a charge for typing and research work upon same and prices will be furnished upon application. These rosters are invaluable to those who are interested in the locomotives that were in service on these roads during this early period.

Present Operating Roads in ( ).

Albany & West Stockbridge (Boston & Albany) 1856.
Allegheny Portage (P. R. R.) 1841, 1847.
Allegheny Valley (P. R. R.) 1870.
Atchison Topeka & Santa Fe R. R. 1877.
Atlantic & Gulf R. R. (A. C. L.) 1874.
Atlantic, Mississippi & Ohio (N. & W.) 1871.
Baltimore & Ohio 1848, 1850, 1856, 1860.
Baltimore & Susquehanna (P. R. R.) 1849, 1851.
Bellfontaine Ry. (C. C. & St. L.) 1867.
Bellefontaine & Indiana R. R. (C. C. C. & St. L.) 1854, 1856.
Black River & Utica R. R. (N. Y. C.) 1856.
Buffalo Corning & New York R. R. (Erie) 1856.
Buffalo, New York & Erie R. R. (Erie) 1862.
Buffalo & State Line R. R. (B. R. & P.) 1856.
Camden & Amboy R. R. (P. R. R.) 1850, 1867.
Camden & Atlantic R. R. (P. R. R.) 1876.
Catawissa R. R. (P. & R.) 1860.
Cayuga & Susquehanna R. R. (D. L. & W.) 1852, 1856.
Canandaigua & Elmira R. R. (P. R. R.) 1856.
Canandaigua & Niagara Falls R. R. (N. Y. C.) 1856.
Central R. R. & Banking Co. of Georgia (C. of Ga.) 1843, 1853, 1858, 1863, 1874, 1881.
Central R. R. of New Jersey 1864.
Charlotte & South Carolina R. R. (Southern) 1860.
Charlotte, Columbia & Augusta R. R. (Southern) 1871.
Chesapeake & Ohio R. R. 1868, 1871.
Chicago & Alton R. R. 1869.
Chicago, Alton & St. Louis R. R. (C. & A.) 1866.
Chicago & North-Western R. R. 1872.
Chicago, Burlington & Quincy R. R. 1858, 1870.
Chicago, Milwaukee & St. Paul R. R. 1882.
Chicago Rock Island & Pacific R. R. 1857.
Cincinnati, Hamilton & Dayton R. R. (B. & O.) 1855.
Cincinnati, Indianapolis, St. Louis & Chicago R. R. (C. C. C. & St. L.) 1880.
Cleveland & Pittsburgh R. R. (P. R. R.) 1854, 1867.
Cleveland & Toledo R. R. (N. Y. C.) 1854, 1861.
Cleveland, Columbus & Cincinnati and Cleveland, Painsville & Ashtabula—Joint Report (C. C. C. & St. L.—N. Y. C.) 1855.
Covington & Lexington R. R. (L. & N.) 1855.
Cumberland Valley R. R. (P. R. R.) 1874.
Delaware, Lackawanna & Western R. R. 1856.
East Tennessee & Georgia R. R. (Southern) 1856.
Erie Ry. 1866.
Flint & Pere Marquette R. R. (P. M.) 1867, 1869, 1872.

Galena & Chicago Union R. R. (C. & N-W.) 1857.
Georgia R. R. 1881.
Georgia R. R. & Banking Co. (Ga. R. R.) 1849, 1877.
Grand Trunk Ry. (C. N.) 1859.
Great Western of Illinois Ry. (Wabash) 1854.
Hannibal & St. Joseph R. R. (C. B. & Q.) 1863, 1872, 1876.
Harrisburg, Portsmouth, Mt. Joy & Lancaster R. R. (P. R. R.) 1844.
Hudson River R. R. (N. Y. C.) 1856.
Hudson & Boston R. R. (Boston & Albany) 1856.
Indianapolis & Cincinnati R. R. (C. C. C. & St. L.) 1857, 1859.
Indianapolis, Pittsburgh & Cleveland R. R. (C. C. C. & St. L.) 1859.
Kansas City, St. Joseph & Council Bluffs R. R. (C. B. & Q.) 1874.
La Crosse & Milwaukee R. R. (C. M. & St. P.) 1857, 1861.
Little Miami R. R. (P. C. C. & St. L.) 1847, 1849, 1852, 1857, 1869.
Little Miami and Columbus & Xenia Roads—Joint Report (PCC&StL) 1863.
Long Island R. R. (P. R. R.) 1856, 1863.
Louisville & Nashville R. R. 1867, 1873.
Louisville & Frankfort R. R. (L. & N.) 1852.
Louisville & Frankfort and Lexington & Frankfort Roads (L. & N.) 1865.
Louisville, Cincinnati & Lexington R. R. (L. & N.) 1868.
Louisville, New Albany & Chicago R. R. (C. I. & L). 1859.
Mad River & Lake Erie R. R. (C. C. C. & St. L.) 1852, 1854.
Madison & Indianapolis R. R. (P. C. C. & St. L.) 1851, 1853.
Manassas Gap R. R. (Southern) 1858.
Macon & Western R. R. (C. of Ga.) 1852, 1865.
Mississippi Central R. R. (I. C.) 1858.
Marietta & Cincinnati R. R. (B. & O.) 1858, 1864.
Marquette, Houghton & Ontonagon R. R. (D. S. S. & A.) 1883.
Memphis & Charleston R. R. (Southern) 1859.
Michigan Central R. R. 1848, 1855, 1867, 1871.
Michigan Southern & Northern Indiana R. R. (N. Y. C.) 1860, 1869.
Mine Hill & Schuykill Haven R. R. (P. & R.) 1853, 1860.
Missouri, Kansas & Texas R. R. 1874.
Missouri River, Ft. Scott & Gulf R. R. (St. L. & S. F.) 1871.
Morris & Essex R. R. (D. L. & W.) 1868.
Nashville & Chattanooga R. R. (N. C. & St. L.) 1855.
New Jersey R. R. & Trans. Co. (P. R. R.) 1864.
New York & Erie R. R. (Erie) 1856.
New York & Harlem R. R. (N. Y. C.) 1841, 1856.
New York Central R. R. 1856.
Norfolk & Petersburg R. R. (N. & W.) 1859.
North Carolina R. R. (Southern) 1858, 1870.
North Missouri R. R. (Wabash) 1862, 1864, 1866.
North Pennsylvania R. R. (P. & R.) 1863.
Northern Central Ry. (P. R. R.) 1856, 1873.
Northern (N. Y.) R. R. (C. Vt.) 1850-52, 1856.
Ohio & Mississippi R. R. (B. & O.) 1858, 1886.
Orange & Alexandria R. R. (Southern) 1856.
Pacific R. R. of Missouri (St. L. & S. F. Mo. P.) 1868.
Pennsylvania R. R. 1850, 1854, 1857, 1861.
Pensacola & Georgia R. R. (S. A. L.) 1868.
Petersburg R. R. (A. C. L.) 1883.
Philadelphia & Columbia Ry. (P. R. R.) 1837, 1838, 1841, 1847.
Philadelphia & Reading Ry. 1844, 1850, 1855, 1861, 1865, 1872.
Philadelphia, Germantown & Norristown R. R. (P. & R.) 1857, 1862, 1870.
Pittsburgh & Connellsville R. R. (B. & O.) 1868.
Philadelphia, Wilmington & Baltimore R. R. (P. R. R.) 1851, 1861, 1881.
Pittsburgh, Ft. Wayne & Chicago Ry. (P. R. R.) 1858.
Raleigh & Gaston R. R. (S. A. L.) 1860.
Richmond & Danville R. R. (Southern) 1858, 1868, 1877, 1881.
Richmond & Petersburg R. R. (A. C. L.) 1853, 1859, 1862, 1879.
Richmond, Fredericksburg & Potomac R. R. 1841, 1891.

Rutland R. R. 1872.
Rutland & Burlington R. R. (Rutland) 1862.
St. Louis & Iron Mountain R. R. (Mo. P.) 1864.
St. Louis Alton & Terre Haute R. R. (C. C. C. & St. L.—I. C.) 1872.
Sandusky, Dayton & Cincinnati R. R. (C. C. C. & St. L.) 1858.
Seaboard & Roanoke R. R. (S. A. L.) 1853, 1866.
South Carolina R. R. (Southern) 1849, 1852.
South Side R. R. of Virginia (N. & W.) 1854.
South Western R. R. of Georgia (C. of G.) 1853, 1855.
Terre Haute, Alton & St. Louis (C. C. C. & St. L.—I. C.) 1857.
Terre Haute & Richmond R. R. (Vandalia) 1864.
Toledo & Wabash R. R. (Wabash) 1861, 1864.
Toledo, Wabash & Western R. R. (Wabash) 1866.
Union Pacific R. R. 1871.
Utica & Schenectady R. R. (N. Y. C.) 1852.
Vermont Central Ry. (C. Vt.) 1851, 1853.
Vicksburg & Meridian R. R. (Ala. & V.) 1869.
Virginia & Tennessee R. R. (N. & W.) 1855.
Virginia Central R. R. (C. & O.) 1853, 1857, 1864.
Watertown & Rome R. R. (N. Y. C.) 1856.
Western & Atlantic R. R. (N. C. & St. L.) 1852, 1856.
Williamsport & Elmira R. R. (P. R. R.) 1858.
Wilmington & Raleigh R. R. (A. C. L.) 1844.
Wilmington & Manchester R. R. (A. C. L.) 1852, 1854, 1860.
Wilmington & Weldon R. R. (A. C. L.) 1860, 1891.
Wilmington Columbia & Augusta R. R. (A. C. L.) 1891.

New Books.

Our members will be interested in the knowledge of the publication of the following new books, both of which are recommended by the Editor of this publication.

"The Story of the Baltimore & Ohio Railroad, 1827-1927", by Edward Hungerford. Published by G. P. Putnam's Sons, New York, 1928. Two Volumes, 737 pages, 6x9".

To those of our members who are interested in the history and development of the Baltimore & Ohio Railroad, we call your attention to this carefully prepared work.

Although the Mohawk & Hudson R. R. was incorporated two months earlier than the Baltimore & Ohio, the latter was the first road in operation for the transportation of passengers and freight, making it America's oldest railroad.

No road has had a more interesting history, passed through more vicissitudes and at the same time it played an important part in the development of railroad transportation. During the Civil War the road was in the midst of the conflict and played no small part for the northern cause. The development of motive power on this road, while it has been to suit its own cir-

cumstances, has been such as to make its effect on other transportation systems.

The book has been written in an interesting and easy fashion. The illustrations are generous in number and excellent in quality. To those of us who visited the "Fair of the Iron Horse", this history will give us an insight into the development of this old transportation enterprise.

"TWO ESSAYS IN EARLY LOCOMOTIVE HISTORY"

I. The First Hundred Railway Engines
II. British Locomotives in North America

By C. F. Dendy Marshall, M. A. Published by the Locomotive Publishing Company, London, England, 1928. 120 p. 8½ x 11".

To those who are interested in early English locomotives in the United States, we would call attention to the foregoing treatise. Mr. Marshall covers this particular subject more fully in the second essay.

He tells us that England supplied 120 locomotives to various railways in the United States up to 1836, after which the importations ceased, due to the progress in locomotive building in this country. British built locomotives furnished Canada are also dealt with in this esay.

The first essay gives the construction, service and other details of the first one hundred railway locomotives, based on a careful research of the material available and makes this data much more convenient for reference than as heretofore given in various publications. In fact, the material presented covers illustrations and details of several locomotives not previously available to the general reader. Mr. Marshall says that of the first one hundred railway locomotives built, ninety were British, one or two German, two or three French and six or seven American.

The author would be glad to receive any additional information regarding the locomotives described, or corrections as to any statements and data given—for use in the event of a reissue of this publication; and should be addressed:

C. F. Dendy Marshall,
Chinthurst Lodge,
Wonersh, Guildford,
England.

IN MEMORY OF

J. SNOWDEN BELL,
Life Member,
Box No. 629, City Hall Sta.,
New York, N. Y.
Who Died on November 27, 1928.

IN MEMORY OF

CHARLES S. GIVEN,
Life Member,
R. F. D. No. 2, Box No. 35,
Bowdoinham, Maine.
Who died on January 7, 1929